CULTURAL RESOURCE INVENTORY AND EVALUATION PROJECT

Homestake Mining Company Properties

Jardine, Montana

WESTECH
Western Technology and Engineering Inc.

ABSTRACT

Two archeological sites and four historical sites were located and recorded during a cultural resource inventory of 3100 acres of land owned by the Homestake Mining Company in Park County, Montana. The two archeological sites are the Johnson Family site (24PA159) and Sargon's site (24PA340). The Johnson Family site is recommended as eligibile for the National Register of Historic Places. Sargon's site is recommended as not eligible for the National Register of Historic Places.

Two historical sites, the Stuart-Schultz Cabins (24PA410) and the Mineral Hill Cabins (24PA185) had been previously located by Forest Service personnel. These sites were revisited and additional recording and historical research done on them. It is recommended that the Stuart-Schultz Cabins (24PA410) and the Mineral Hill Cabins (24PA185) are eligible for the National Register of Historic Places as part of the Jardine Historic District. The Hanlon Hill Adits (24PA342), a new historical site, is recommended as not eligible for the National Register. The Jardine site (24PA339) is recommended as eligible for the National Register of Historic Places as an historic district.

ACKNOWLEDGEMENTS

The Mineral Research Center would like to thank the individuals and agencies that contributed to this study. We received assistance from the Montana Historical Society, the Butte-Silver Bow Public Archives Department, the Gardiner District of the Gallatin National Forest, the Park County Clerk and Recorders Office, the Park County Museum. Library of the Montana College of Mineral Science and Technology and the Montana Bureau of Mines and Geology. Special thanks go to Bill and Doris Whithorn of the Park County Museum in Livingston, Mr. Dave Walter of the Montana Historical Society Library, Mr. Ty Tanner of the Homestake Mining Company, and Mr. Paul Anderson whose excellent photographic documentation of the town of Jardine is included in this report.

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PART I

INTRODUCTION

In the summer of 1981, the Mineral Research Center in Butte, Montana was contracted by Westech Inc. of Helena, Montana to perform a cultural resource inventory and evaluation project on selected lands (approximately 3100 acres) in the Jardine, Montana area located in Park County (Figures 1 and 2) several miles north of Yellowstone National Park. Westech Inc. is an environmental planning firm that is preparing an environmental study of the Jardine area for the Homestake Mining Company which recently purchased the property. The Homestake Mining Company is planning a hardrock mining project in the Jardine area.

The purpose of this cultural resource study report is to identify, evaluate and to recommend for mitigation cultural resources that might be impacted by proposed mining activity in the Jardine study area in accordance with federal and state legislation.* Two prehistoric sites and four historic sites were located in the survey (Figure 3).

The areas surveyed are listed below.

Jardine Study Area

Township 9 South, Range 9 East

All of Section 8
All of Section 9
S1/2 of Section 5
S1/2 of Section 4
S1/2 N1/2 of Section 4
W1/2 of Section 3
W1/2 of Section 10
N1/2 NW1/4 NW1/4 of Section 15
N1/2 NE1/4 NW1/4 of Section 15
N1/2 NE1/4 NE1/4 of Section 16
N1/2 NW1/4 NE1/4 of Section 16
N1/2 NE1/4 NW1/4 of Section 16
N1/2 NW1/4 NW1/4 of Section 16
W1/2 NW1/4 NW1/4 of Section 16
W1/2 SW1/4 NW1/4 of Section 16
NW1/4 NW1/4 SW1/4 of Section 16

*Antiquities Act of 1906; the National Historic Preservation Act of 1966, as amended; the National Environmental Policy Act of 1969; Executive Order 11593 of 1971; the Archeological Resources Protectection Act of 1979; the Montana State Antiquities Act of 1973, as amended; the Montana Environmental Policy Act; and the Montana Surface Mining Act.

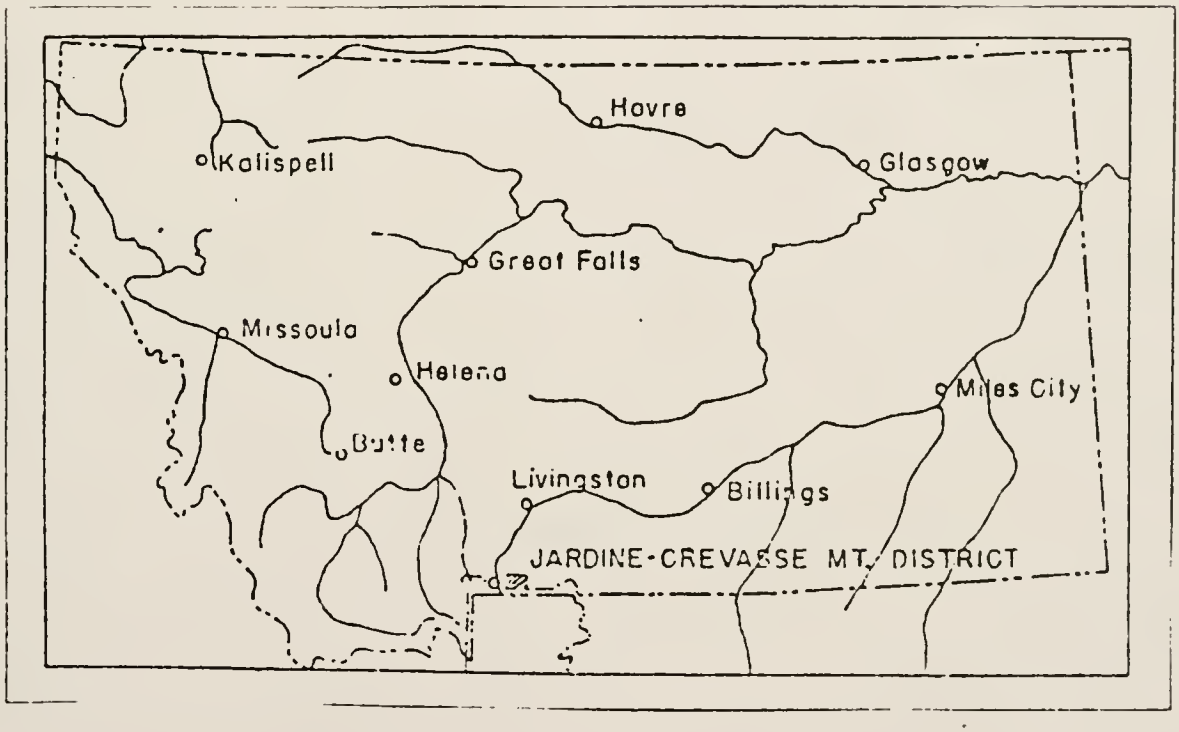

Figure 1. Map showing location of project area in Montana.

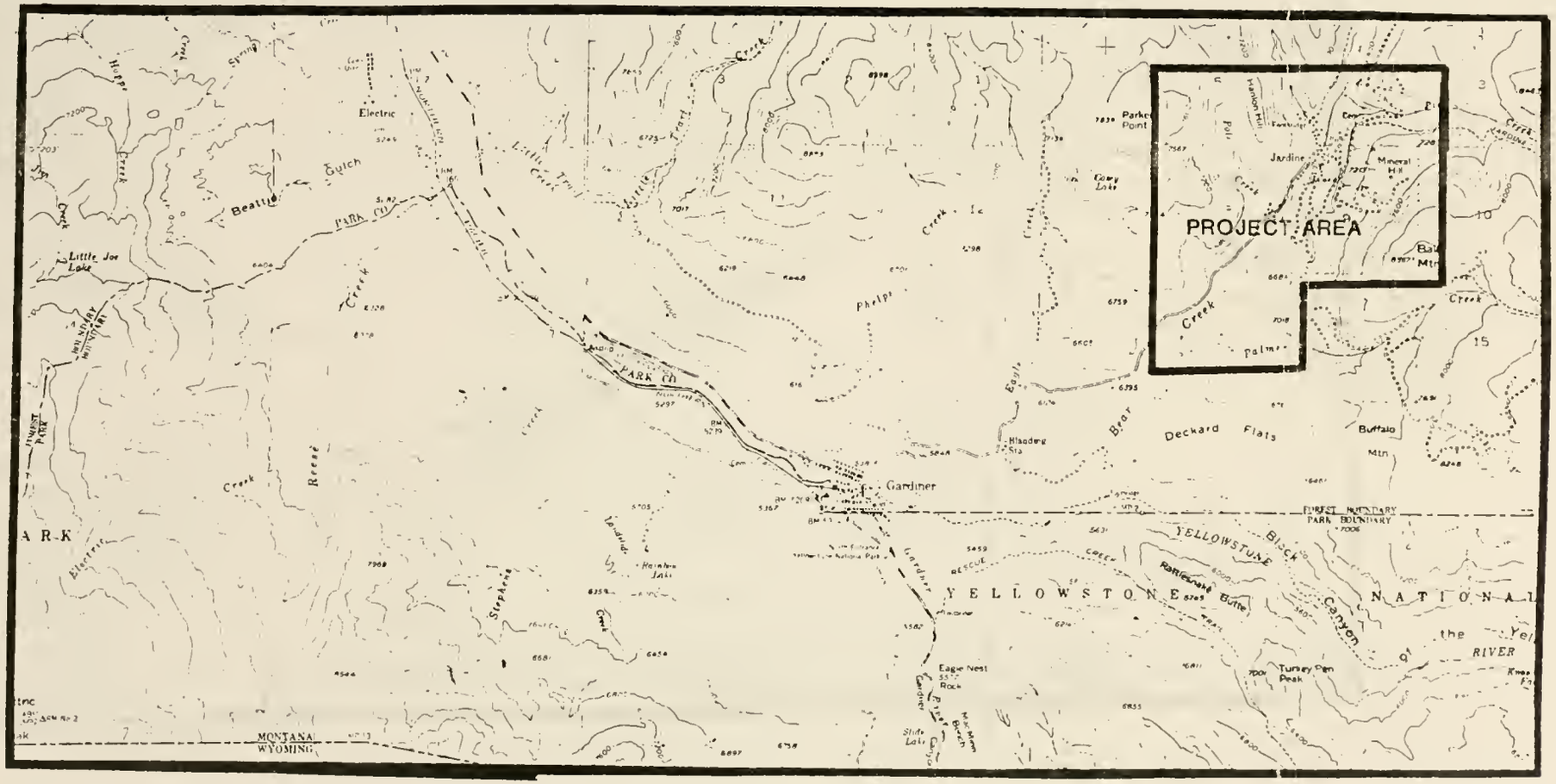

Figure 2. Maps showing location of the project area. U.S.G.S. Quadrangles: Gardiner, Montana - 1955 and Miner, Montana - 1955.

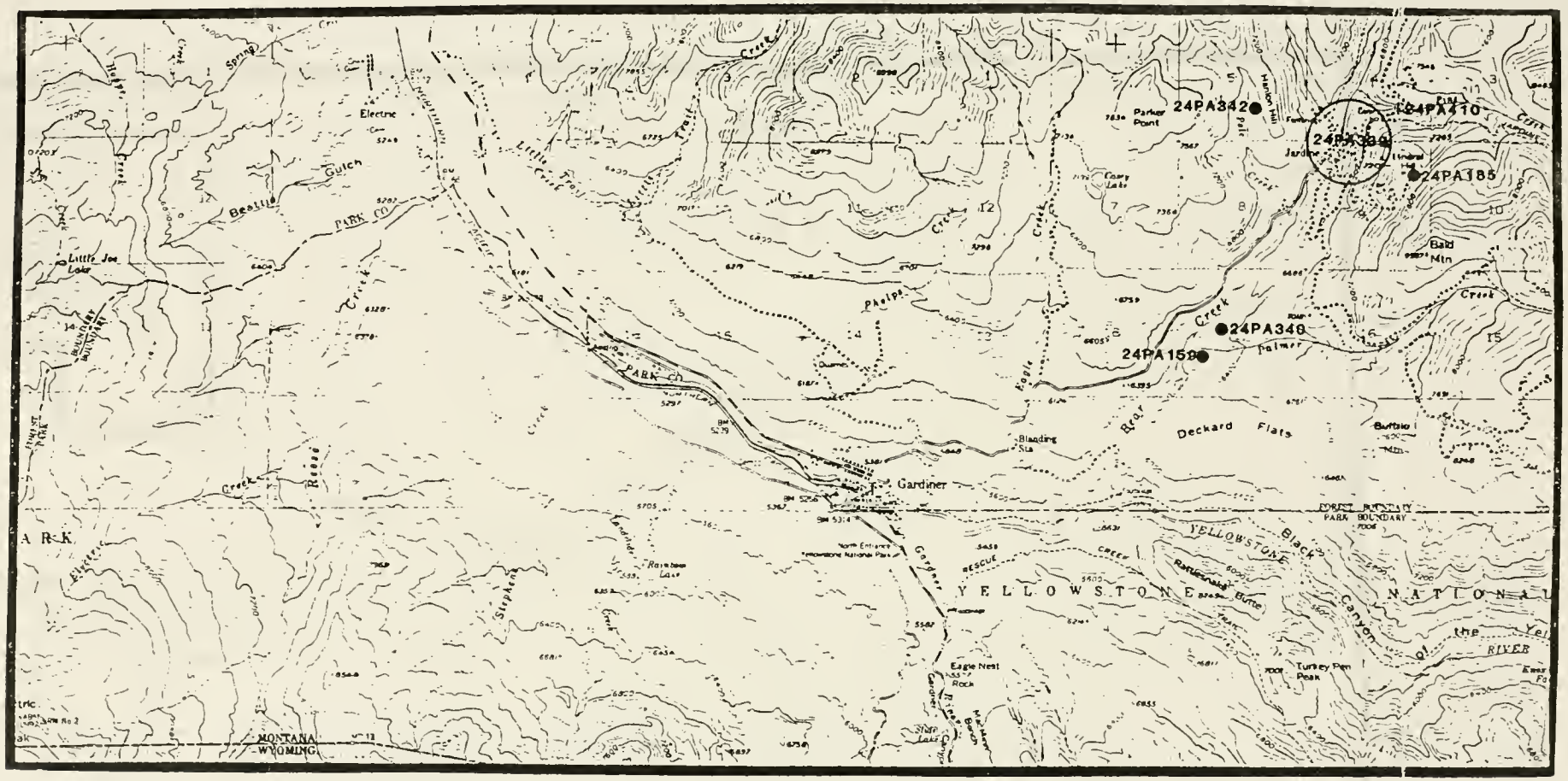

Figure 3. Map showing location of prehistoric and historic sites.

NW1/4 of Section 17
NE1/4 of Section 17
N1/2 SW1/4 of Section 17
N1/2 SE1/4 of Section 17
E1/2 NE1/4 NE1/4 of Section 18
E1/2 SE1/4 NE1/4 of Section 18
E1/2 NE1/4 SE1/4 of Section 18
E1/4 NE1/4 NE1/4 of Section 7
E1/2 SE1/4 NE1/4 of Section 7
E1/2 NE1/4 SE1/4 of Section 7
E1/2 SE1/4 SE1/4 of Section 7

The field survey was conducted between September 1-14, 1981 by Peter L. Steere (Principal Investigator), Paul Anderson (Historian), Fredric Quivik (Architectural Historian) and three field assistants: Tim McGinnis, Arlene Ekland and Connie Moore. The prehistoric data was assembled and analyzed by Peter Steere and Dale Herbort. The historic data was analyzed by Peter Steere, Paul Anderson and Fredric Quivik. The architectural data was assembled and analyzed by Fredric Quivik.

PART II

METHODOLOGY

Historical Methodology

Background Research

Mineral Research Center historians and historical archeologists conducted a preliminary records search before the field survey began. The files of the Montana Statewide Archeological Survey at the University of Montana, Department of Anthropology were reviewed for a listing of all previously recorded sites in the project area. Several previously recorded sites existed in the project area. These will be discussed later in the report. The Montana Historic Preservation Office in Helena was contacted for sites within the project area that are listed on or may be eligible for the National Register of Historic Places. The cultural resource site files at the Gallatin National Forest Supervisor's office in Bozeman and the District Ranger's office in Gardiner were examined. Bureau of Land Management records including General Land Office plat maps, mineral and land entry fillings, mineral surveys and mineral and homestead patent records were examined. United States Geological Survey reports, bulletins and folios that covered the Jardine area were reviewed.

Photographic, journal and manuscript collections at the Park County Museum in Livingston, the World Museum of Mining in Butte, the Montana Historical Society Library and Archives in Helena, and the economic geology division of the Montana Bureau of Mines and Geology in Butte were researched. The files of the Clerk and Recorders Office of Park County were examined. These included deed books, incorporation papers, plat books, maps, mineral filing and entry records and tax records. In addition, the incorporation files of the Montana Secretary of State's office in Helena were reviewed for information pertaining to mining corporations that operated in Jardine. Mr. Aubrey Haines, retired Yellowstone National Park historian now residing in Bozeman, was contacted for information on the history of the Jardine area. Historical informants in the Jardine, Livingston and Gardiner areas with knowledge of the Jardine mines were interviewed. Telephone interviews were done with informants residing out-of-state. Local and county historians, both published and unpublished were consulted and reviewed.

Field Inventory

The field inventory was conducted in September of 1981. During the first week, the principal investigator and three field assistants with extensive experience surveyed the entire project area. Two prehistoric sites located were mapped, photographed and tested during the first week. All historic sites located in the first week were marked on U.S.G.S. Quadrangle maps blown up to larger size. During the second week, the principal investigator, the historian, and the architectural historian recorded all historic sites and made contact with historical informants in the area.

Recording at each historic site included planimetric mapping of all structures and features. Color slides and black-and-white photographs were taken of each structure or feature. A photo log was maintained and field notes kept for each site. The architectural historian made sketches of each structure and kept field notes on the architectural characteristics of each building.

Archeological Methodology

Background Research

Before the start of the field survey, staff archeologists reviewed all pertinent literature and records specific to the Jardine project area in the Upper Yellowstone country. Archeological data concerning site types and their relationship to specific ecological zones were stressed. The files of the Statewide Archeological Survey and the Montana State Historical Preservation office were reviewed for previously recorded cultural resources sites in the project area. Local amateur archeologists were contacted and interviewed. Several private collections of prehistoric artifacts were examined.

Field Inventory

An intensive field inventory of the project area was performed by the principal investigator and three field assistants. This project area is located in terrain that is heavily forested and often has slopes greater than 30° - 40°. The normal procedure of walking systematic transects at no greater than 30 m intervals was somewhat modified. In open-flat terrain along creek bottoms and on bluff tops systematic transects at no greater than 30 m intervals were walked in a zig-zag pattern to achieve maximum coverage. On steep mountain slopes zig-zag side hill transects were walked at intervals no greater than 70 m. All areas likely to contain evidence of cultural resources (i.e., areas of erosion, cutbanks, rock outcrops, overhangs and cores were closely examined). Many of the historical sites in this project area consist of buildings, mine adits and mine waste development dumps that are visible from a considerable distance.

Prehistoric site recording methods were designed to fully document all observable cultural materials and features. When a site was located, its boundaries were determined. Each site was walked over at 5 m or less intervals. Each surveyor placed pin flags by each artifact, flake or cultural feature. A datum was established and the site mapped, noting the location of each artifact, flake or feature. The principal investigator then made a decision where to place subsurface test pits. All test pits were 1 m^2 and were excavated to a depth of at least 50 cm or until bedrock or sterile soils were encountered. Field assitants then collected all diagnostic cultural materials including projectile points, bifaces, unifaces, knives, scrapers, cores, modified flakes and a representative sample of all lithic types on the site. Since both prehistoric sites located in the survey were relatively small in size and contained a small amount of surface material all cultural material was collected on the surface of the site.

Specific site recording procedures included recording on site forms acceptable to the Montana State Historic Preservation Office. All sites received Smithsonian numbers from Dr. Dee Taylor at the University of Montana. Site sketch maps were prepared for all cultural resource sites taking care to locate all visible cultural materials on the map. Each site was photographed in color and black-and-white. All natural phenomena in a site area including vegetation, exposure, wind, topography and water were noted.

Subsurface testing was conducted to determine presence and depth of cultural deposits, to determine temporal relationships and to assist in determining site boundaries. Artifacts were washed, labeled and catalogued in the laboratory. Prehistoric data analysis consisted largely of lithic analysis of collected materials from the two prehistoric sites and examination of private collections in the local area that may have come from the recorded site locations.

Lithic Material Type

All collected and observed artifacts and flakes consist of one of the following lithic material types:

Obsidian is a volcanic glass of which the closest recognized sources are Yellowstone National Park, ten miles to the south and the Centennial Valley, seventy-five miles to the southwest.

Yellowstone agate is a fine-grained translucent silicate which is found as nodules in Tertiary gravels of the Yellowstone River. Although more commonly found in the area between Billings and Glendive, agate nodules still occur in the Upper Yellowstone area.

Chert is a dense hard cryptocrystalline rock with high silica content. All the chert artifacts and flakes seem to be derived from chert cobbles which are found in both Bear Creek which flows through the project area in the Yellowstone River to the south.

Glossary of Mining Terms

It was felt that the following glossary of mining terms would be useful since most of the cultural resources located in this project area are related to historic mining activity.

Adit. A horizontal gallery or opening driven from the surface which gives access to an ore body.

Air-shaft. A shaft used for ventilating mines, either transferring fresh air to underground workings or discharging exhaust air to the surface.

Alluvial. Loose gravel, mud or soils that have been deposited by water.

Altered rock. A rock which has underground chemical changes since its original deposition.

Amalgamation. The process of recovering gold and silver with mercury from ores.

Angle brace. This is a wooden or metal brace used to prevent mine timbers from moving or shifting.

Apex. The outcrop of a vein on the surface or the uppermost end of a vein that does not outcrop on the surface.

Assay. Method using chemicals or fire to determine content of precious metals in a ore or soil sample.

Bar placer. A bank of gold-bearing gravel or sand located in the slack portion of a stream.

Bench placer. A terrace-like deposit of gold-bearing gravel or sand.

Bit. The part of a drill that cuts and chips the rock.

Black sand. Grains of heavy dark minerals such as magnetite, chromite, ilmenite found in streams that may carry gold values.

Breast. This is the vertical end surface of a working.

Bulkhead. A timber, metal or concrete dam to contain water, tailings or air.

Caving System. A mine stoping technique utilized to take advantage of some ores to cave.

Chocks. Hydraulically operated roof support systems.

Concentrate. High grade material procued from an ore by separations from materials of no value.

Coyoting. Method used to reach gold deposits resting on bedrock in a placer deposit without removing all of overburden. This is a shaft with radiating tunnels.

Crib. A timbering system in which individual members are laid on top of one another to form a rectangular opening in center or to build solid support.

Cross-cut. A horizontal level driven at a large angle often 90° to the strike of a vein.

Drift. A horizontal underground opening driven along the course of a vein.

Face. The working area of a development heading.

Fault. Fracture in the earth of which sides are displaced in relationship to one another.

Firing. Detonation of explosives.

Float. Loose pieces of ore that have broken and are often displaced from outcrop.

Flotation. Method of separating minerals from finely crushed ore in which ores are placed in solution. Air bubbles attached to certain minerals float to surface.

Footwall. The lower enclosing wall of a vein.

Gallows-frame or headframe. Structure erected over shaft to support sheave wheel for hoisting.

Free-milling ore. Ores that can be reduced without roasting.

Hanging wall. The upper enclosing wall of a vein.

High grading. Theft of valuable ore by miners.

Horse. A large amount of waste rock in a vein.

Lagging. Timber planks around sets to prevent material from falling into opening.

Leaching. The use of chemicals to remove valuable minerals from ores often left in large piles.

Level. All of the connected mine openings at a certain elevation.

Lode. A vein of ore that contains some type of metal.

Ore. Rock with minerals present in sufficient quality and quantity which can be mined at a profit.

Ore shoot, ore body. Part of the vein that carries ore.

Outcrop. Edge or surface of a mineral deposit that is exposed on ground surface.

Overburden. Material overlying the pay zone in a placer deposit or non-mineralized rock over an ore body.

Oxidation. Exposure of a mineral to oxygen.

Oxidized zone. That part of an ore body that has been exposed and altered by weathering and certain oxygen-bearing materials.

Pillar. Ore or waste rock left in place underground to give support.

Placer. A deposit of minerals not in place, usually tin, gold or platinum in gravels.

Powder or giant powder. Miner's term for dynamite.

Raise. Excavation underground that is driven upward from a level in the mine.

Rake. The way the ore body in a vein trends.

Riffle. Channels, grooves, slats or wire screens in a sluice box or rocker that catch valuable minerals.

Rockbolts. Steel bolts placed in holes drilled in rock to help support rock.

Roaster. Furnace used in ore reduction process in a smelter.

Rockburst. Explosion of a stressed rock.

Roof. The overhead part of a mine working.

Room and pillar. A mining system in which part of the ore is mined out and part is left for support.

Round. A group of drill holes in a face that ensures breakage of ore when holes are blasted.

Shaft-vertical. Vertical excavation made from surface for locating ore, ventilation, draining water or for hoisting.

Shaft-inclined. A shaft that is not vertical.

Silicosis. Lung disease caused by silica or quartz dust, often from dry drilling.

Slag. Waste refuse from smelting process. Usually is high in iron content.

Sill. The floor or bottom of a mine passage.

Single-jacking. One man hand drilling.

Double-jacking. Team of two men drilling.

Sluice-box. A trough usually of wood with riffles through which gravel from a placer operation is washed.

Stope. An underground excavation to remove ore other than development work.

Stull. Timber used to support hanging wall.

Trommel. Revolving screen used in placer mining.

Vein. Well defined mineralized zone.

Winze. Shaft opening sunk from a level in a mine to develop ore zone.

PART III

GENERAL FEATURES AND PHYSIOGRAPHY OF THE PROJECT AREA

Environment

The Jardine study area is located in mountainous terrain approximately four miles north of Gardiner, Montana. The area is in the northern part of the Absaroka Range along the northern boundary of Yellowstone National Park. The Absaroka Range is a northwest-trending mountain range that extends for nearly 200 miles from Livingston, Montana south into Wyoming. The northern part of the Absaroka Range is known locally as the Snowy Mountains. The project area is marked by steep slopes that culminate in both flat-topped and broadly rounded mountain crests (Figure 4). The streams in the project area are perennial and are often confined to narrow channels whose steep walls often rise a 1000 feet without break. The area also has some broad undulating upland meadows. Maximum relief from the town of Jardine to the top of Mineral Hill is approximately 1000 feet. Elevations vary from 6000 to 8000 feet above sea level.

The Jardine area is drained by Bear Creek and its tributaries; Pole Creek, North Fork Bear Creek, Pine Creek and Palmer Creek. Bear Creek flows through a steep-walled and deep gorge when it leaves the townsite area and flows into the Yellowstone River approximately one mile east of Gardiner.

The lower western and southern parts of the Jardine or Sheepeater Mining District are largely untimbered with the exception of riparian zone plant growth along drainages and stream channels. These untimbered areas are covered with range grasses, sagebrush and buckbrush. That part of the district that this study preliminary focuses on is in the northern and eastern zones which are heavily forested with stands of lodgepole pine, Douglas fir and spruce.

Climatic contrasts between the lower valley floors and mountainous upland of this part of Park County are marked. Temperatures in this region are generally low and are marked by wide seasonal and daily variations.[1] The climate can be described as semi-arid. Mild summer months are usually followed by extended storm periods and decreasing temperatures. Average monthly precipitation reaches maximum values in May and June and declines to minimum values in December and January[2]. The dry climate is conducive to the longevity of perishable materials, such as wooden structures on mining sites. The area does receive heavy snow in the winter and these snow accumulations can often result in the collapse of roofs and occasionally entire structures.

The Jardine mining district is well supplied with water from its perennial streams. In several areas abundant water supply and topography were located

Figure 4. Aerial photograph of Jardine study area. Arrow indicates center of town. U.S. Forest Service, Gallatin National Forest.

in such a way to encourage the development of hydroelectric power. In 1903, the Kimberly-Montana Gold Mining and Milling Company constructed a hydroelectric plant in Bear Gulch several miles below the town of Jardine and not far from the Yellowstone River.[3] This plant, torn down only a few years ago, provided electric power for the town, the mills and the underground mines. Most of the Jardine mines operated above gravity drainage levels, so flooding was never a serious problem in underground workings.[4]

Geology

Since the great majority of cultural resource sites encountered in this project area are directly related to historic mining activity it is important to have a basic understanding of the areal geology.

The earliest geological investigations of this area were conducted by the United States Geological Survey in the late 1880s and early 1890s.[5] These studies generally contain little information on ore occurrence or mining activity, but focus on descriptive geology, petrography and paleontology of the Yellowstone Park area. Very brief mention is made of mining activity occasionaly in the volumes of the Mineral Resources of the United States.[6] The earliest report to deal with mining activity and ore occurrence in the area focused on the presence of tungsten minerals. Cathcart of the United States Geological Survey studied the Jardine area in 1924 but never published his research. Wilson studied and mapped the Gardiner thrust zone which has structural connections with the Jardine area in 1934.[8] Between 1925-1950, three research studies were completed on the Jardine-Crevasse area that provide detailed information on geology, mining and milling activity.[9]

The Jardine area is mountainous, characterized by steep slopes and deeply entrenched streams. Surface features in the area are basically related to the erosional activity of Bear Creek and its tributaries, North Fork and Pine Creek. South of the town of Jardine, the gorge that holds Bear Creek becomes steeper as the stream flows toward the Yellowstone River. The Decker Flats, southwest of Jardine are underlain by basalt floors. Several attempts were made to locate buried placers below this area before 1900. Hanlon Hill rises 800 feet above Jardine on the west. Mineral Hill rising nearly a thousand feet from the town on the east was the site of almost all of the intensive mining activity that took place in this district.

The Jardine area lies at the southwestern end of the Beartooth-Absaroka plateau, an area of regional uplift that measures nearly 50 by 90 miles across. Thousands of feet of Paleozoic and Mesozoic strata and volcanic material has been eroded away exposing Pre-Cambrian schists, gneisses and other intrusives.[10] The Beartooth and Gardiner thrust faults border the northeast and southwest parts of the uplift. In these border areas, the Paleozoic and Mesozoic strata are greatly folded and overturned while within the uplift area, Cambrian strata are arranged almost horizontally. Wilson suggested in his study that the area is an example of a large-scale tectonic wedge.[11]

It appears that the ore deposits exploited in the Jardine area are confined to the Pre-Cambrian schist complex which was brought up by the Beartooth-Absaroka uplift and also exposed by erosional forces.

Most of the Jardine area is underlain by schist and quartzite series of rocks while the remainder is underlain by intrusive and extrusive igneous rock, Paleozoic and Mesozoic sedimentary rocks, glacial gravels, alluvial gravels and alluvial silts[12] (Figure 5).

Basic rock types in the area include:[13]

1. Pre-Cambrian metamorphics
   a) biotite quartzite and quartz-biotite schist
   b) quartz-cummingtonite-hornbende schist

2. Pre-Cambrian intrusives
   a) mica-granite
   b) pegmatite and aplite
   c) gabbra and diabase

3. Teritary and quaternary volcanics
   a) rhyolite porphyry and vitrophyre
   b) biotite-quartz latite porphyry and latite porphyry
   c) tuffs and basic breccias
   d) basalt

4. Paleozoic and mesozoic rocks
   a) limestones, sandstones and shales in fault contact zone

5. Quaternary deposits
   a) stream and lake deposits
   b) glacial deposits
   c) travertine

Seager points out that the gold-tungsten-arsenic deposits of the Jardine-Crevassa district are unusual structurally and mineralogically because they are the only known occurrence of Pre-Cambrian gold deposits in Montana and one of very few known in the United States.[14] It is believed that they were formed under high temperature and pressure in a deeply buried zone. The deposits at Jardine are similar to those at the Homestake Mine in South Dakota, the Atlantic Gold District in Wyoming and gold deposits in New Mexico and Arizona.[15]

The described lodes of the Jardine area appear to be in the west extension and near a small anticline. The lodes strike in a northerly direction for nearly 3,000 feet and range from 15 to 80 feet in width.[16] Veins appear to be associated with enclosing schists and exhibit folding.. Reed identifies six major veins with their numerous splits and describes them as being irregularly spaced, lenticular in habit, exhibiting a echelon pattern and having width from a few inches to fifteen feet.[17]

There are two basic vein types present which are distinguished by mineral composition and nature of surrounding rocks. Quartz veins in biotite quartzine and quartz-biotite schist commonly occur in Jardine lodes and contain quartz with gold, scheelite, arsenophyrite, pyrite and galena. The economic quality of these beins is erratic. The second type of vein is arsenopyrite in quartz-cummingtonite schist. This group contains quartz and sulfides

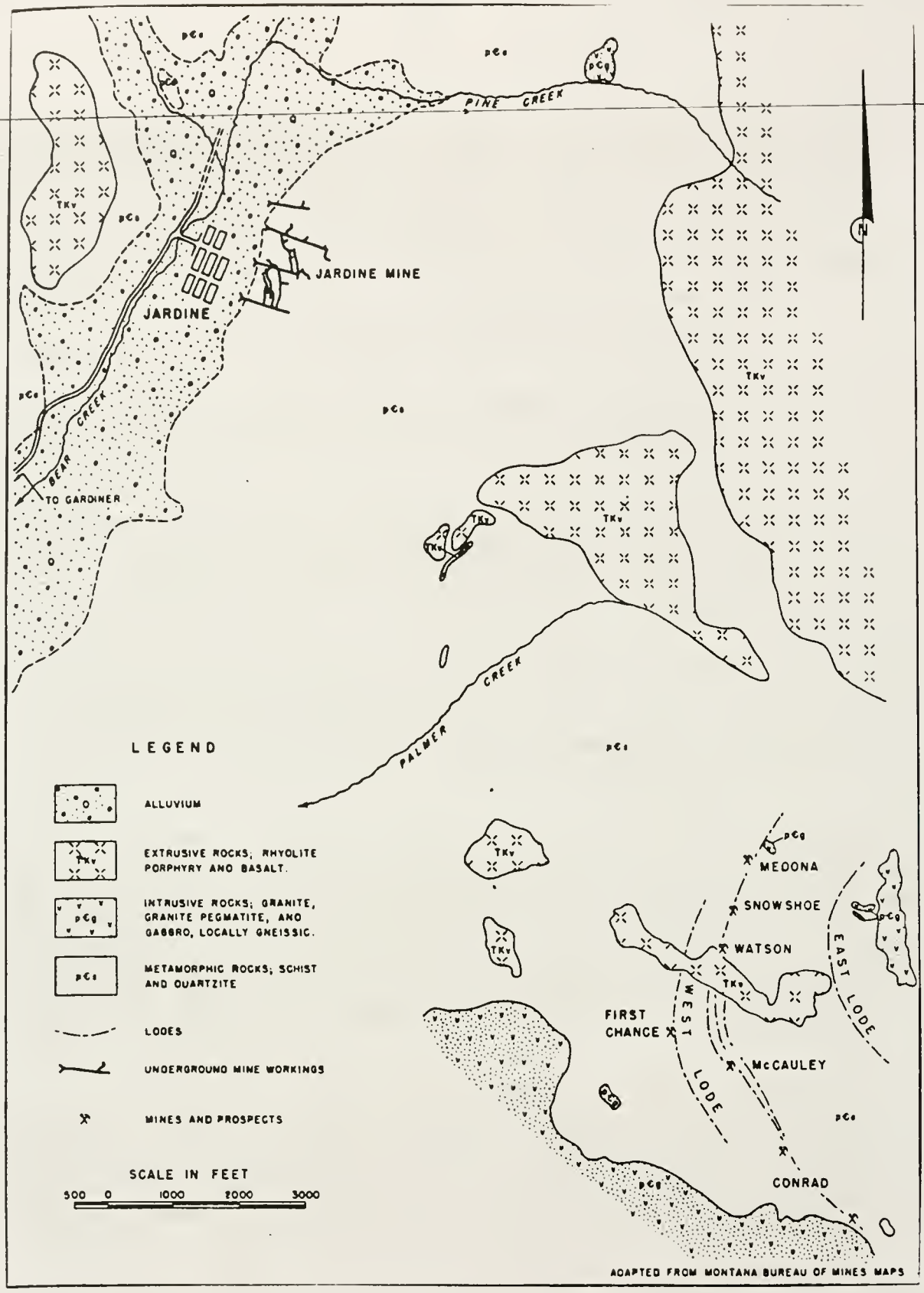

Figure 5. Geologic map of Jardine - Crevasse area, Park County, Montana. (Bureau of Mines Information Circular #7546, 1950).

with more consistant gold values. Tungsten is generally not found in this group of veins.[18] Minerals found in these veins include; quartz, feldspar, cummingtonite, hornblende, biotite, garnet, arsenopyrite, scheelite, pyrite, pyrrhotite, chalcopyrite, sphalerite, galena, chlorite, gold, siderite and calcite. Gold, scheelite and arsenopyrite are the minerals of economic importance. Three distinct types of ore have been described for the Jardine-Crevasse district and are presented in outline below;[19]

I. Siliceous ore (gold-tungsten)
   A) Quartz carrying gold and tungsten values. Tungsten is in the form of scheelite.

II. Sulphide ore
   A) Quartz-arsenopyrite ore (gold-arsenic-tungsten)
   B) Disseminated pyrrhotite-pyrite-arsenopyrite ore (gold-arsenic-small values of tungsten)

III. Oxidized ore (gold-tungsten) weathered product of sulphide ores.

Mining activity in the Jardine area has almost exclusively been confined to the lode deposits on the west face of Mineral Hill. Exploratory prospects can be found on Hanlon Hill to the west, on Baldy Mountain to the southeast, and along Pine Creek and Germania Hill to the north, but these deposits never were fully developed. All significant production comes from the workings on Mineral Hill. The Crevasse area, not covered by this report, was an important producer prior to 1900.

PART IV

PREHISTORIC AND HISTORIC OVERVIEW

Prehistoric and Paleoenvironmental

The project area of this study incorporates portions of south central Montana. The study area is located within the Northwestern Plains culture area and includes a variety of habitats and ecozones that were exploited by prehistoric populations.

Chronological cultural sequences for western Montana are generally derived from several primary sources.

1) Malouf's division of western Montana prehistory into Early Hunters, Forages and Late Hunters periods.[20]

2) Mulloy's outline for the Northwestern Plains based on fieldwork in southeastern Montana and northern Wyoming.[21]

3) Leonhardy and Rice's summary of Snake River (western Plateau) regional prehistory.[22]

4) Swanson's prehistoric chronology for southeastern and central Idaho.[23]

5) Frison's modification of Mulloy's chronological framework for the Northwestern Plains.[24]

The chronology developed by Frison will be utilized here and it includes seven major cultural periods. The cultural periods and their representative complexes are:

I. Paleo-Indian Period (ca. 12,000-5,500 BC)

Clovis Complex (10,000 - 9,000 BC)
Folsom Complex (9,000 - 8,500 BC)
Agate Basin and Hell Gap Complexes (8,500-8,000 BC)
Alberta - Cody Complex (7,500 - 6,500 BC)
Frederick and Lusk Complex (6,500 - 5,500 BC)

II. Early Plains Archaic (ca. 5,500 - 2,500 BC)

Mummy Cave Complex (5,500 - 3,500 BC)
Oxbow Complex (3,500 - 2,500 BC)

III. Middle Plains Archaic Period (ca. 2,500 - 1,000 BC)

McKean Complex (2,500 - 1,000 BC)

IV. Late Plains Archaic (ca. 1,000 BC - AD 200)

Pelican Lake Complex (1,000 BC - AD 200)
Besant Complex (400 BC - AD 600)

V. Late Prehistoric Period (ca. AD 200 - 1800)

Avonlea Complex (AD 200 - 900
Old Women's Complex (AD 700 - 1800)
Prairie and Plains Side-Notched Complexes (AD 700 - 1800)

VI. Protohistoric Period (ca. AD 1700 - 1800)

Period of indirect or direct contact with white culture.

VII. Historic Period. (ca. 1800 - present)

There is considerable disagreement amongst archeologists as to the dates of these cultural periods particularly the transition from the Late Plains Archaic to the Late Prehistoric period. Some of the above periods are subject to change as new information accumulates. The project area is within a region that is on the fringes of two culture areas, the Northwestern Plains and the Interior Plateau. Interpretation and evaluation of prehistoric sites must take this into consideration. Figure 6 illustrates some of the projectile points associated with specific chronological periods.

Climatic conditions do not remain constant over any long period of time. As most vegetative and animal communities are particularly sensitive to prevailing climates, it is important to have a knowledge of climatic conditions at any one time in order to determine how man adjusted and adapted to changing conditions.

Archeologists working in this region are fortunate to have several Paleo-environmental studies reported in the literature. In addition to Knoll's[25] study of Pleistocene glacial and periglacial landforms in the Lemhi Range of Idaho, there are two important studies on the changing Holocene environment of the general area. Swanson[26] presents information from the Birch Creek valley in Idaho south of the Bitterroot Range. Swanson's information derives from 200 archeological and geological studies of rockshelter deposits. Mehringer and others[27] present the results of pollen studies done in a bog near Lost Trail Pass.

The Swanson and Mehringer studies present a picture of a changing Holocene climate for the Bitterroot Range. The sequences is presented below. Certain features of the sequence are compared with corresponding features of other well known regional and continental climatic sequences (Reeves,[28] Benedict,[29] Bryson, Baerreis and Wendland[30]). Figure 7 summarizes these various climatic sequences and correlates them with several regional cultural chronologies.

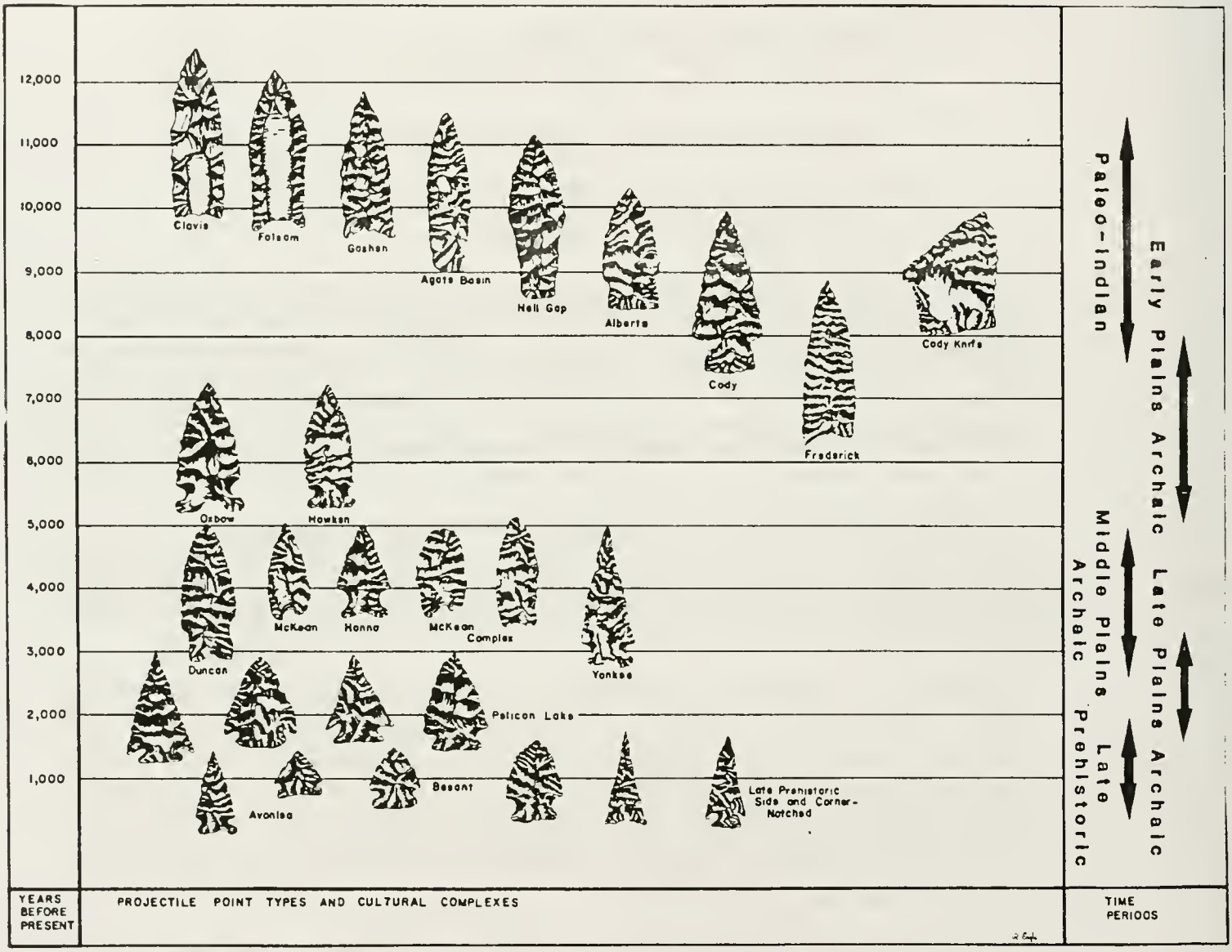

Figure 6. Projectile point types and cultural complexes.

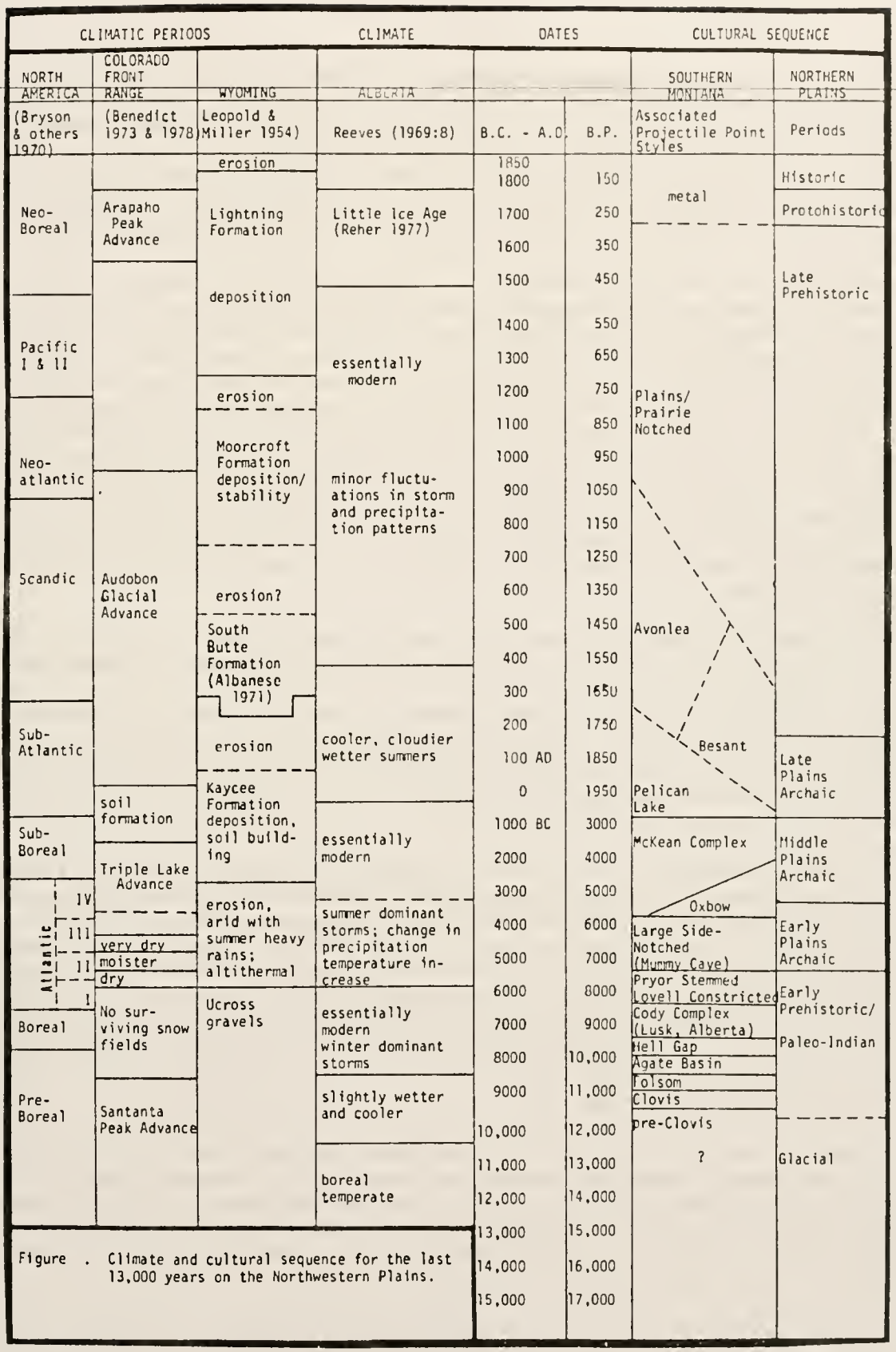

Figure . Climate and cultural sequence for the last 13,000 years on the Northwestern Plains.

Figure 7. Climate and culture sequences for the last 13,000 years on the Northwestern Plains.

Although Krieger[31] has offered an hypothesis for a "pre-projectile point horizon" or "pre-Clovis horizon" in the western United States, there is no conclusive evidence for such an horizon in the southcentral portion of Montana. For the most part, the artifcts in this proposed horizon are crude, percussion flaked tools; flakes, scrapers and choppers with a noticeable absence of bifacially flaked projectile points, knives or blades. These types of artifacts are often found in recent prehistoric sites in association with bifacially flaked projectile points, knives and blades. The presence of pre-Clovis cultural occupations from the Northwestern Plains has been suggested, but has yet to be convincingly demonstrated. Zeimens and Walker,[32] Guilday, Hamilton and Odan,[33] Gilbert,[34] and Anderson[35] discuss cave sites and a single game trap, all with Late Pleistocene faunal remains, but no clear demonstration of human presence. Frison[36] in a discussion of the Little Canyon Creek Cave site in Wyoming reports on a possible pre-Clovis cultural stratum, but cautions that a great deal more evidence and research is needed to clarify this pre-Clovis problem.

Most sites of the Palo-Indian period are identified on the basis of large lanceolate spear points that were hafted to wooden shafts and used to hunt large mammalian game animals. The earliest of these types of projectile points, the Clovis and Frison are generally distinguished by a central flute on each side of the blade, although unfluted Clovis and Folsom points are found. They probably represent an earlier stage of manufacture. Clovis and Folsom cultural groups were associated with a Late Glacial and Pre-Boreal climatic episodes.

The first widespread cultural manifestation on the Northwestern Plains was the Clovis Complex. Clovis Complex sites date to the Late Pleistocene or Early Holocene, due to the lack of mutual agreement on when the Pleistocene ended or the Holocene began. Surface finds of Clovis points have been reported from the drainages of the Yellowstone River in Montana, as well as areas in north central Wyoming. The Anzick site reported by Taylor,[37] Lahren and Bonnichsen[38] was apparently a Clovis burial site with associated projectile points, preforms and bone foreshafts. The most reliably dated Clovis site in the Northwestern Plains is the Colby Mammoth site in the Big Horn Basin of Wyoming).

Frison[39] also reports Clovis cultural material from the Carter-Ken McGee site in Wyoming. McGrew[40] reports cultural association with mammoth at the Union Pacific Mammoth site, although this is challenged by Haynes[41] because of the lack of diagnostic Clovis material. The Lindsay Mammoth site in eastern Montana may be a Clovis site, but again the lack of diagnostic material causes some doubt[42].

With the disappearance of the mammoth on the Northwestern Plains, Folsom cultures follow the Clovis. Frison suggests that the Goshen complex from the Hell Gap site in Wyoming may intervene between Clovis and Folsom[43]. Dated Folsom sites include the Brewster site[44] in eastern Wyoming, the Hanson site,[45]

in northern Wyoming. The Hell Gap site[46] in eastern Wyoming and the Lindenmeier site[47] in northern Colorado. An important undated Folsom cultural occupation was uncovered at the MacHaffie site near Helena, Montana.[48] Other undated Folsom sites in Wyoming are discussed by Frison.[49] Folsom culture was a geographically widespread successful hunting and gathering adaptation. Folsom points are amongst the most distinctive of all Paleo-Indian projectile points.

Frison[50] suggests that around 8000 B.C. some of the Paleo-Indian occupations were beginning to diverge from a predominantly big game hunting complex to a lifeway that depended more on a hunting and gathering subsistence base, and at the same time were utilizing different ecological zones, namely foothill and slopeland areas. While this suggestion has merit, it may also reflect a lack of information on gathering activities of Clovis and Folsom cultural groups, in addition to other game species they may have utilized. The Paleo-Indian cultural groups of the period following 8000 B.C. are represented by Hell Gap, Agate Basin, Cody Complex, Allen, Angostura and Alberta projectile points. Agate Basin type points have been found in eastern Wyoming,[51] and at Hell Gap site in Wyoming.[52] Lynn Fredlund[53] reports an Agate Basin type projectile point found near the Tongue River Reservoir. Husted[54] describes points resembling Agate-Basin projectile points from the Big Horn Canyon in Wyoming and Montana. Frison[55] discusses an Agate-Basin - Hell Gap stratigraphic level at the Carter-Kern McGee site in Wyoming.

Hell Gap materials are reported from Sister's Hill,[56] the Casper site,[57] the Hell Gap site,[58] and an isolated Hell Gap occurrence near Decker, Montana.[59] The Alberta Complex has been described by Irwin-Williams,[60] at the Hell Gap site in Wyoming. Cody Complex materials include Eden Valley and Scottsbluff projectile points, Cody knives and several other distinctive tools. From Wyoming cultural artifacts of the Cody Complex are reported from the Finley site,[61] the Horner site,[62] and the Medicine Lodge Creek site.[63] From a dry wash near Decker, Montana a single Eden Valley projectile point was found.[64] Recently Zeimens[65] reports the occurrence of a probable fall season bison kill associated with Cody materials in the eastern Powder River Basin of Wyoming. In general during this time period the climate is assumed to have been cooler (Boreal) and the fauna to have included mastodon, camels, large bison species and other animals, many of which are extinct today.

As the climate became warmer during the Atlantic climatic period it is felt that subsistence cultural patterns began to shift to a larger degree from an apparent intensive dependence on large game animals to a more varied subsistence base. The difference,however, may be more apparent than real due to an inadequate sample of the earlier Paleo-Indian period cultures. Frison[66] discusses increased utilization of foothill and mountain econiches as opposed to the open plains. This period is characterized by the cultures of the Late Early Prehistoric period or Late Paleo-Indian period: Frederick, Lusk, Pryor stemmed and Lovell constricted projectile points being the representative types. Frison and Grey[67] in a recent article describe the Pryor stemmed cultural groups as Late Paleo-Indian groups that operated in small groups and were specialized toward a gathering economy. From the Hell Gap site, Frederick points were noted to be in

association with a stone circle. This component dates at 6400-6000 B.C.[68] Above the Frederick level was a small deposit of cultural materials called Lusk. There was no date to this level, but the projectile points were similar to those from the Betty Greene site, thought to date around 5000 B.C.[69] The Betty Greene site also yielded other tools, several metate fragments and a mano, which suggest increased utilization of vegetable foods.

Projectile points similar to Frederick were described from mixed deposits at Benson's Butte near Decker, Montana.[70] Pryor-stemmed and Lovell constricted are reported from two rock shelters in the Bighorn Canyon,[71] and from Schiffer Cave in the Bighorn Mountains.

Frison and Grey[72] also report Pryor stemmed points from the Medicine Lodge Creek site and the Point Rock V site in north-central Wyoming. The James Allen projectile point dates to the Late Paleo-Indian period and was reported from the James Allen site.[73] Frison[74] suggests that the Allen projectile point is related to the Frederick complex. The Angostura projectile point was discovered at the Ray Long site in western South Dakota.[75] It appears to be another manifestation of the Late Paleo-Indian period on the Northwestern Plains. Lahren[76] reports on two types of points which exhibit parallel-oblique flaking and parallel transverse flaking from the stratified Myers-Hindman site in the Upper Yellowstone River Valley near Livingston, Montana.

The pattern of human settlement and utilization on the Northwestern Plains in the Paleo-Indian period is just beginning to emerge. It has been suggested human utilization on the Northwestern Plains moved from a pattern of resource utilization dependent on large herbivores to a more generalized pattern utilizing a variety of econiches found on the plains and a wider variety of small mammals with an increasing dependence on vegetal resources gathered.

Within this study area, a possible Paleo-Indian site has been recorded by the Forest Service in 1970.[77] This site (24PA159) is located near the confluence of Bear Creek and Palmer Creek. This site located partially on private land was collected by the landowner who reported large lanceolate projectile points similar to Clovis material. The collection was lost in a fire and this cannot be verified. This site will be discussed at length in the site narratives. Mr. Otho Mack of Gardiner, Montana reports finding a Clovis point base during the course of an excavation for a building in Gardiner.

Early Plains Archaic

The Early Plains Archaic period appears to have coincided with the Atlantic climatic period. Antevs in his early climatic study suggested that there there may have been a cultural hiatus on the Northwestern Plains during this period due to a deteriorating climate.[78] Evidence in recent years seems to suggest that rather than a hiatus on the plains there developed a utilization

of different ecological zones, namely the foothills and mountainous areas. This period is marked by a technological style change in projectile points from the lanceolate Paleo-Indian types to Early Plains Archaic side-notched types. The best dated site of this period is Mummy Cave, a stratified occupation site near Yellowstone National Park with C-14 dates clustering around 7500 B.P.[79] Projectile points recovered from Mummy Cave have been labeled Blackwater side-notched and Pahaska side-notched. Frison[80] reports similar early archaic points from the Pretty Creek site near Pryor Gap in Montana. Frison and Wilson[81] describe another Early Plains Archaic site called the Granite Creek Rockshelter where Early Plains Archaic cultural material was stratigraphically overlain by McKean Complex artifacts. Lahren[82] defined an Early Plains Archaic level at the Myers-Hindman site and Frison describes the Early Plains Archaic at the Hawken site in the northeast corner of Wyoming.

At the Kobold site just north of Decker, Montana, the lower stratigraphic level was found to contain Early Plains Archaic projectile points.[83] Gregg reports that one site (24BH62) near Decker, Montana might also fall within this time period.[84] Frison suggests that sites of this period have not been properly interpreted, accounting for the supposed hiatus of sites of this period in the Northwestern Plains.[85]

Preliminary site data for this period in the Northwestern Plains seems to suggest heavier usage of foothill and mountain environments.

Middle Plains Archaic Period (ca. 2500-1000 BC)

The Middle Plains Archaic period is marked by the appearance of the McKean Cultural Complex. Frison suggests a dramatic climatic change occurred around 2500 B.C., and with this was the proliferation of bison remains in McKean Complex archeological sites.[86]

The Middle Plains Archaic (3000 B.C. -1000 B.C.) is represented in the region by numerous reported sites. Few sites have been excavated and thoroughly analyzed. The type site for the McKean Complex is located in northeastern Wyoming and was reported by Mulloy.[87] Sites of this period are characterized primarily by three projectile point types which range and intergrade from the lanceolate McKean to the stemmed Duncan to the corner-notched Hanna. More recently, the Yonkee point, a side/corner-notched, indented base atlatl point, has been included within the McKean complex. Milling stones and other artifacts and features representing vegetable food procurement and use are also common with McKean occupation sites. Occupation campsites as well as bison kill sites are associated with McKean materials, and are found in a wide variety of ecological zones, from high mountain country to riparian zones in river valleys. The large number of sites in this period may suggest a general increase in population at this time and an expansion of these populations into niches not heavily utilized by previous cultural groups. Zeimens states in a description of

the Powder River country in Wyoming:

> The interior basins begin to be utilized heavily, mainly for the procurement of vegetable foods as evidenced by the large number of milling stones and roasting pits present in the sites.[88]

This proposed population expansion seems to correlate temporally with the cooling trend of the Sub-Boreal climatic episode, largely similar to modern climate.

One of the earliest known dates of the McKean Complex comes from the Sorenson site and dates at 2950 B.C.[89] It seems probable that the population dynamics of bison herds in southeastern Montana were undergoing great change in this time period also.

A number of arroyo-trap bison kills of this period have been located and excavated. These kill sites include the Yonkee site (Bentzen 1961), near Broadus, Montana,[90] site 48SH312, on the Powder River in Wyoming,[91] site 48SH311 on Buffalo Creek in north central Wyoming,[92] the Kobold site on Rosebud Creek in southern Montana,[93] and the Scoggin site north of Rawlins, Wyoming.[94] Other period sites include the Rigler Bluff site (24PA401), in the upper Yellowstone River Valley,[95] the Carbella site (24PA302) in the upper Yellowstone River Valley.[96] McKean complex artifacts are also reported by Lahren[97] from the Myers-Hindman site. McKean complex material is also reported from mixed deposits at Benson's Butte.

Stone circles begin to appear in this period and are discussed at some length by Malouf,[98] Kehoe[99] and Frison.[100] Various functions have been suggested for them.

Approximately 2.5 miles southwest of this study area is located the Eagle Creek site (24PA301) recorded and partially excavated by Arthur.[101] He reported four occupation levels based on diagnostic projectile points characteristic of McKean Complex from the Middle Plains Archaic and several others from the Late Plains Archaic and Late Prehistoric periods. This site is not located in the project area. Lahren[102] reports on several other sites in the Upper Yellowstone Valley that have Middle Plains Archaic components. These include the Sphinx site (24PA508) and the Six Mile site (24PA501). Neither is located in the project area.

Late Plains Archaic Period (ca. 1000 BC - AD 200)

In the Northwestern Plains, the Late Plains Archaic period is characterized by several varieties of corner-notched projectile points known as Pelican Lake. Frison suggests that bifaces with rounded bases, sharp points and steeply beveled edges may be diagnostic of this period.[103] A large number of sites has been reported from this time period, and again it has been suggested that this was a period of population increase. The climate seems

to have trended toward a slightly cooler and moister period. This may have been a climatic episode similar to the historically documented Little Ice Age when the plains-mountain environment experienced an increase in available forage which in turn permitted the support of a larger population of bison and subsequently a larger human population.

The Pelican Lake type site is in the lower levels of the Mortlach site in Saskatchewan.[104] Reeves reports Pelican Lake material from The Head-Smashed-In Buffalo Jump in Alberta.[105] Other sites or components of sites of this period include the Old Women's Buffalo Jump in Alberta, Wahkpa Chu'gn (24HL101) in north-central Montana, Keaster site (24PH401), the Schmitt site in S.W. Montana, Small Emigrant Kill in the Yellowstone River Valley, Myers-Hindman, in S.W. Montana, Mummy Cave and the Magic Mountain site in Colorado.[106] Reeves suggests that the Upper Miles subphase of Pelican Lake predominates in the southeastern Montana area.[107] A small rock shelter, Colt 45, near Colstrip, in the lowest level yielded two radiocarbon dates A.D. 20 $^{+}$120 and A.D. 45 $-^{+}$100 (GX-2550 and GX-2559), but no associated projectile points.[108]

In the Decker, Montana area sites falling typologically into this period[109] make up approximately 40% of the total of temporally classifiable sites Waldman, in survey of the Montco project, a 16,000 acre area on the east side of the Tongue River south of Colstrip, Montana, reports that 50% of temporally identifiable prehistoric sites are Late Archaic.[110]

In the later part of the Late Plains Archaic the Besant cultural complex appears on the Northwestern Plains. The type site is from certain levels of the Mortlach site in Saskatchewan. Frison describes Besant as an "extremely sophisticated bison hunting manifestation".[111] Two prominent sites with Besant material are the Ruby site in the Powder River country of Wyoming and the Muddy Creek site on the North Platte River. Both of these sites are bison kill sites that utilized a pound or corral technique. This use of artificial structures strongly suggests a new sophistication in bison hunting techniques.

Johnson also suggests that Besant projectile points may be associated with cultural groups making Woodland pottery in the Upper Missouri area.[113] The Sphinx site (24PA508), the Small Emigrant Kill (24PA309) and the Myers-Hindman site (24PA504) all located in the Upper Yellowstone River drainage contain Late Plains Archaic components.[114] None of these sites are located in the immediate project area. The Late Plains archaic period occurred during the Sub-Atlantic climatic episode, a period that was cool and cloudy characterized by wet summers.

Late Prehistoric Period (ca. AD 200 - 1700)

A technological change of some importance marks the Late Prehistoric period in the Northwestern Plains. This is the utilization of the bow and arrow as a weapon and hunting tool. Projectile points were reduced in size and

altered manufacturing techniques were developed. Small expanding flakes struck from cores of varying lithic material were fashioned into projectile points. Most other tool types do not seem to undergo any dramatic changes technologically or morphologically.

The earliest of these Late Prehistoric period side-notched projectile points is called Avonlea from the type site in Saskatchewan.[115] Pottery also appears in this time period on the Northwestern Plains. The most frequently encountered type of pottery is Shoshonean or Intermountain Tradition type. Frison also reports carved steatite vessels from several sites in Wyoming and Montana.[116] Mandan Tradition pottery and Crow pottery styles also appear at a few sites in Wyoming and Montana.[117]

Within the Late Prehistoric period numerous projectile point styles appear. They appear to be on a continuum of variation from corner-notched to side and tri-notched points. Excavated and dated sites of this period include the Wardell site in Wyoming, the Head-Smashed-In Buffalo Jump in Alberta, the Sorenson site in the Bighorn Canyon, the Foss Thomas site near Decker, Montana, the Glenrock Buffalo Jump in Wyoming, and the Vore site in Wyoming.[118]

Frison describes a poorly-known cultural manifestation of the Late Prehistoric period in the mountains and foothills of southern Montana and Northern Wyoming.[119] The Benson's Butte site may be characteristic of this type of site, as well as the Beehive site in Wyoming.[120]

Within the Late Prehistoric period projectile point styles exhibit great variability along a continuum from the small corner-notched Avonlea points through a sequence of side and tri-notched points. Many of these "types" exhibit similar dimension in notch-width, body width, and thickness, but differ as to the locations and symmetry of notches. In the latter part of the Late Prehistoric period tri-notched points begin to predominate, as represented at the Big Goose Creek site near Sheridan, Wyoming, Kobold IV and the Foss Thomas site.[121]

In the Pine Breaks area of southeastern Montana, many of the datable sites are from the Late Prehistoric period. Near Colstrip, the Colt 45 Shelter contained small side-notched points, stone tools, and bison, deer and antelope faunal remains. The Old Homestead Kill site, and the BLM Bison Trap were single incident bison kill sites both containing an assortment of small side-notched points. Both are postulated to have been winter/spring kills.[122] Other bison kill sites in the Colstrip area that have been excavated or dated and may fit in the same time period include the Sandrock Bison Kill site, and the Fadhl Kill site.[123] The Sly Bison site contains a bison bone bed on a north facing slope, an adjacent processing area and appears to be a single component kill site of the Late Prehistoric period.[124]

There were several major climatic changes that occurred during the Late Prehistoric period which may have resulted in some population displacements. Projectile point types are difficult to place in absolute time frameworks and there appears to be mixing of various types.

In the Upper Yellowstone River drainage, a number of sites have been reported that contain components from this cultural time period. They include: the

Six Mile site (24PA501), Sphinx site (24PA508), Eagle Creek site (24PA301), Large Emigrant Kill (24PA308), Horse Creek Burial and the Myers-Hindman site (24PA504).[125] Projectile points characteristic of the Late Prehistoric period were found at 24PA159, a site located by Forest Service personnel in 1970 during the course of this project area survey.

Protohistoric Period (ca. AD 1700 - 1800)

This period is marked by the introduction of the horse among the Northwestern Plains Indian cultural groups. Frison estimates that this started in the first decades of the eighteenth century.[126] Important changes in Plains Indian cultures probably included increased expansion of trade networks, increased population movements, expansion of geographical area covered in daily and seasonal rounds, and changes in hunting techniques.

Sites of this period are usually marked by the presence of small amounts of European trade goods such as trade beads, metal trade points, iron knives and brass items. Frison also comments on the appearance of horse bones at sites of this period.[127] The Brawner Burial (24PA503) located in the upper Yellowstone River drainage consists of a juvenile female skeleton covered with trade goods and appears to be from this time period.[128]

Historic Period (ca. 1800 - present)

The south-central portions of Montana were occupied historically by several distinct native American groups. The Blackfeet areas were north of the Yellowstone River from the Musselshell River to the Divide.[129] The Crows occupied land from the Yellowstone River southward into Wyoming between the Powder River and the Absaroka-Wind River Mountain chains.[130] The Shoshoni's occupied country from the Wind River and the Absaroka Mountains westward to the Blue Mountains of Oregon and into northern Nevada and Utah.[131] Haines identifies a Shoshoni group as being the primary residents of the Yellowstone Plateau area in historic times.[132] Hultkrantz describes these groups as having a specialized mountain culture hunting and gathering economy.[133] Haines describes several wickiup structures consisting of conical dried poles that have been found in Yellowstone Park that he attributes to Shoshoni sheepeater groups.[134] Malouf, however, feels these wickiups were Crow hunting lodges.[135] The Flatheads and Nez Perce did not live in the Yellowstone Plateau region but may have traveled through the area.

The first documented party of American explorers, the Lewis and Clark Expedition passed through Montana in 1805. Captain Clark on the return journey to St. Louis traveled along the Yellowstone River approximately 75 miles north of this project area in 1806.[136] Lewis and Clark found many of the native-American societies of the upper Missouri area receptive to Euro-Americans and to the fur trade. One year after they returned, Manuel Lisa, one of the first American fur traders in Montana, established a trading post, Fort Raymond at the confluence of the Yellowstone and Bighorn Rivers and provided a start for large-scale fur trading on the upper Missouri.[137]

On the return trip of the Lewis and Clark expedition, one of its members, John Colter, left the group at a Mandan village and returned up river with Joseph Dixon and Forest Hencock.[138] In the spring of 1807, Colter left his two companions and started down the Missouri. He met up with a large expedition coming up river led by Manuel Lisa to trap and trade for furs. Colter joined the group and they traveled up the Yellowstone to the mouth of the Bighorn. In the fall of 1807, Lisa sent Colter out to invite the Indians to come in to trade.[139] During this 500 mile trip, Colter crossed into what is now Yellowstone Park and although it is difficult to pinpoint his journey excactly, there can be little doubt that Colter was the first white visitor to see some of the unusual geological features of Yellowstone Park.[140]

The next trappers to reach the Yellowstone plateau country were from the Canadian Northwest Company. Alexander Ross recorded the travels of a fur brigade led by Donald McKenzie in 1818 which noted "boiling fountains".[141] Alexander Ross returned to the area in 1824 leading a brigade of the Hudson's Bay Company that had recently absorbed the Northwest Company. Haines reports the finding of a cache of Hudson Bay Company iron traps near Beaver Lake in the 1880s by the Superintendent of the Park, Mr. Norris. During the next three decades trapping brigades explored much of south central Montana and may have explored up Bear Gulch into this project area, but there is no positive evidence to substantiate this. Russell records and describes many trapping expeditions into the Upper Yellowstone country in the 1830s.[142]

The next major influx of whites into Montana came with the discovery of rich gold placers in the early 1860s. In July of 1862, placer gold was discovered on Grasshopper Creek and the rush was on. Subsequent discoveries at Montana City, Alder Gulch, Last Chance Gulch, Emigrant Gulch and Conferate Gulch brought thousands of miners into the western mountains of Montana. Some of these miners made their way into the upper Yellowstone country in search of gold. In 1863, a Colonel DeLacy led a group of prospectors into parts of Yellowstone Park and in the same year James Stuart led a ill-fated prospecting expedition into the lower regions of the Yellowstone River that was attacked by Sioux Indians.[143]

In 1864, the Phelps-Davis party of prospectors traveled through Yellowstone Park and followed the Yellowstone River heading for the new placer camp at Emigrant Gulch.[144] George Phelps, leader of this group, reported the discovery of placer gold in the Yellowstone River near present-day Gardiner. Phelps was to become deeply involved in mining activity in the Bear Gulch area.

Another group, led by George A. Huston traveling to Emigrant Gulch discovered placer gold at Bear Creek in 1864 which they named for a bear cub observed there.[145] Interest was sparked in the Bear Gulch when Uncle Joe Brown and three other men recovered $1800 in gold dust from a river bar at the mouth of Bear Gulch in 1866.[146] Shortly after, Lon Anderson discovered gold in Crevice Creek to the east of Bear Creek.[147] These discoveries mark the start of mining activity in the Jardine area. This study will focus on Jardine and its mining history. This area was first known as the Bear Gulch Mining District but has also been referred to as the Sheepeater District, the Jardine District and the Jardine-Crevasee District at various points in time. The Crevasee District is regarded as distinct from the Jardine District and will not be examined in this report.

The Jardine area was originally part of Gallatin County which was one of the original nine counties established by the territorial legislature in 1865.[148] The first important settlements in Gallatin County were agricultural communities at East Gallatin and West Gallatin in 1863. Park County was created in 1887 from parts of Gallatin County. A major gold rush occurred in Emigrant Gulch in 1863. Early settlements sprang up at Yellowstone City, Chicory, Sweetgrass, Benson's Landng, and Chico. Cooke City started after the discovery of silver in 1879.[149] The coal towns of Aldridge, Horr and Electric sprang up in the 1890s and flourished for approximately two decades. Some coal mined here was shipped for use in Jardine. Cinnabar was one of the stations that had been placed every ten miles on the Northern Pacific Railroad line as it extended south from Livingston. With the establishment of Yellowstone Park in 1872 and the construction of the railroad south from Livingston to Cinnabar in 1883 development of the area was encouraged. The town of Gardiner at the north entrance to Yellowstone National Park grew up in anticipation of being the terminus point for the Northern Pacific railroad.

While the discovery of gold in Bear Creek has been credited to several different individuals there is no doubt that "Uncle Joe" Brown (Figure 8), one of those so credited, was to become an important figure in the first three decades of Bear Gulch mining history. In May of 1866, Brown is credited with taking $1800 worth of gold from placer deposits near the mouth of Bear Creek, sluicing surface gravels and also seeking placer gold in ancient stream channels or Bear Creek buried by Decker Flat basalt flows.[150] From 1866 to 1884, Joe Brown and his partner, Mr. Vilas worked placer ground on a modest scale. In 1870, Joe Brown and James Graham located gold-quartz veins on Mineral Hill. They constructed an arrastra, mined some ore and milled it on a small scale.[151] Between 1866-1869, Campbell, Cohen, and Long constructed a ditch from the head of Bear Creek to supply water for placer mining.[152] Between 1875-1877, Joe Brown and his partners constructed another series of water ditches for placer operations. These ditches in later years provided water for hydraulic operations and an electric power plant on Bear Creek

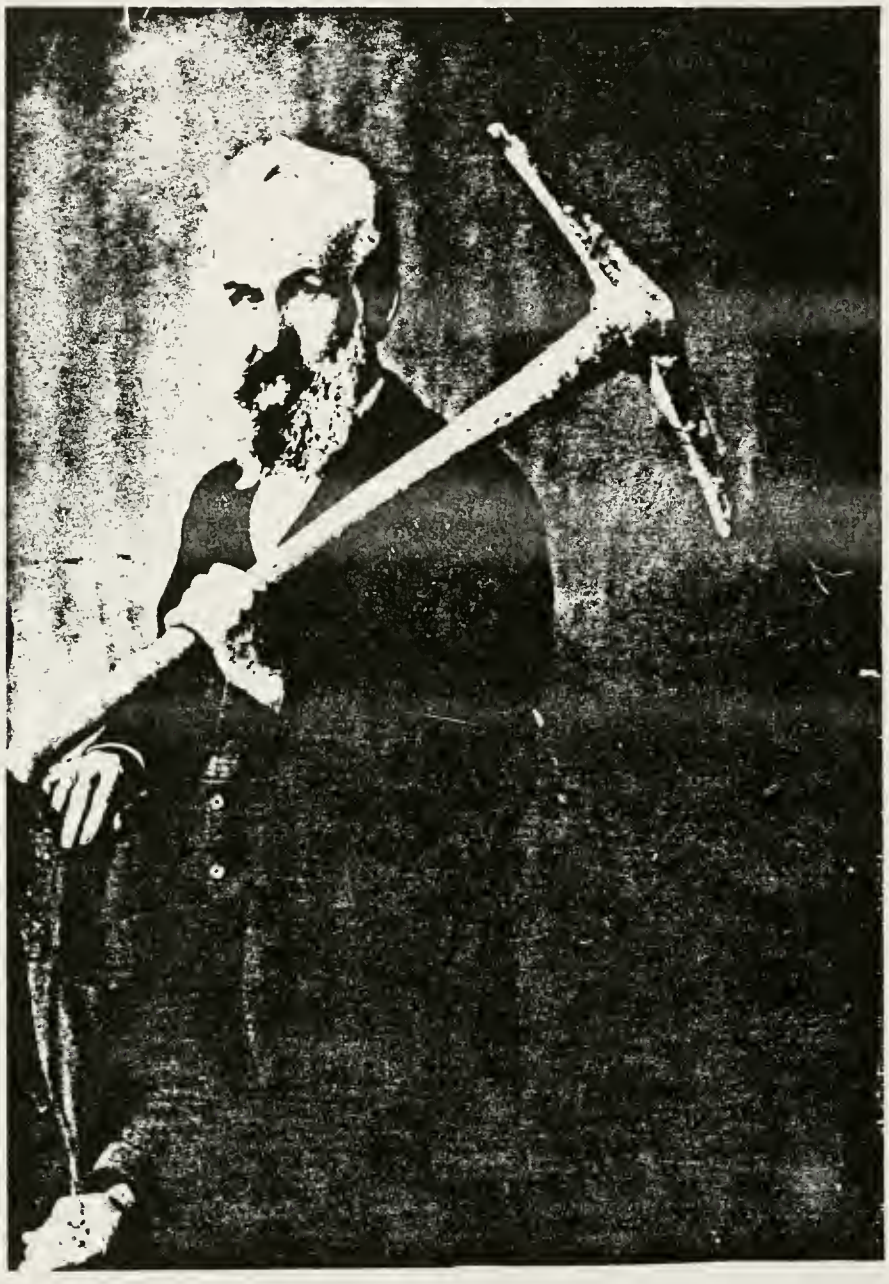

Figure 8. Photograph of Joe Brown (ca. 1900) (courtesy of Bill and Doris Whithorn, Park County Museum, Livingston.)

Although sporadic work on placer grounds and lodes continued in the 1870s, no claims were surveyed or patented until the 1880s. The first recorded claim was the Graham Lode filed by James Graham and Joe Brown on April 18, 1882.[153] Appendix I contains copies of all of the mining claim survey plats for the Sheepeater District. Throughout this period the Bear Gulch camp consisted of a small number of log cabins clustered on the east bank of Bear Creek.

In 1884, Joe Brown and his partners sold their placer claims to Major Eaton and Thomas Sturgis who started the Bear Gulch Placer Company. Major Eaton, later became Surveyor or General of Montana and because a prominent figure in the early mining history of the New World Mining District around Cooke City. Eaton and Sturgis equipped the property with "the most powerful hydraulic apparatus for placer mining in the world at that time".[154] The hydraulic apparatus seen in Figure 9 had a vertical fall of 400 feet through 1200 feet of 12 inch pipe, which led to a nozzle six inches in diameter. The operation apparently was not successful for Seager reports that the operation recovered only $100 in gold.[155] This company also drove a 400 foot tunnel from the hydraulic cut (Figure 10) to connect with a 97 foot shaft sunk by Joe Brown into stream gravels of an older Bear Creek channel.[156] The work started by the Bear Creek Placer Company directed by Eaton and Sturgis lasted less than a year. Disagreements between property holders and lack of additional capital brought an end to this operation. One of the men who filed on several placer claims with Major Eaton in the early 1880s was one Harry Bush who was to become an important figure in the Bear Gulch area around the turn of the century. A story in the Livingston newspaper places Bush in Bear Gulch as early as 1884 when he and C.A. Carson were arranging transporation for a three-stamp mill to be shipped from Livingston to Bear Gulch to work ore from their lode claim.[157]

Eaton also constructed a five-stamp amalgamation mill and sawmill in 1884. Transporation problems caused a shutdown after only a short period of operation.[158] This mill was located at the south end of the present townsite of Jardine and was used to mill oxidized surface ore. Figure 11, a photograph of Jardine taken in 1898, shows the mill built by Major Eaton with a tram leading to it. By this time there had been several additions to the mill made by Edgerton and Jewell and Harry Bush. Mining claims continued to be filed and small-scale mining activity continued through the late 1880s. In 1890, Edgerton and Jewell of Helena purchased Eaton's mining claim and mill. They added five stamps to the mill and continued for three years to mill oxidized surface ores from the Sowash and Legal Tender mines.[159] They operated till 1893, when a nationwide financial crisis which included the repeal of the Sherman Silver Purchase Act shut down operations again. From 1893 to 1898, some activity continued in Bear Gulch. Small placer claims were worked as were small lode claims. Additional mining claims continued to be filed in the area. In the summer of 1895, A.W. Miles and W. H. Lee of Fridley started a sawmill near the Bear Gulch camp. A. W. Miles, a newphew of General Nelson Miles, was to become a prominent Livingston business man and mayor. The sawmill is shown in Figure 12. Activity in the Bear Gulch remained quiet until the summer of 1898 when Harry Bush arrived in town.

Harry Bush was born in England in 1858[160] and appears to have spent some time involved in mining activity in South Africa. Bush and his wife Adeline, shown

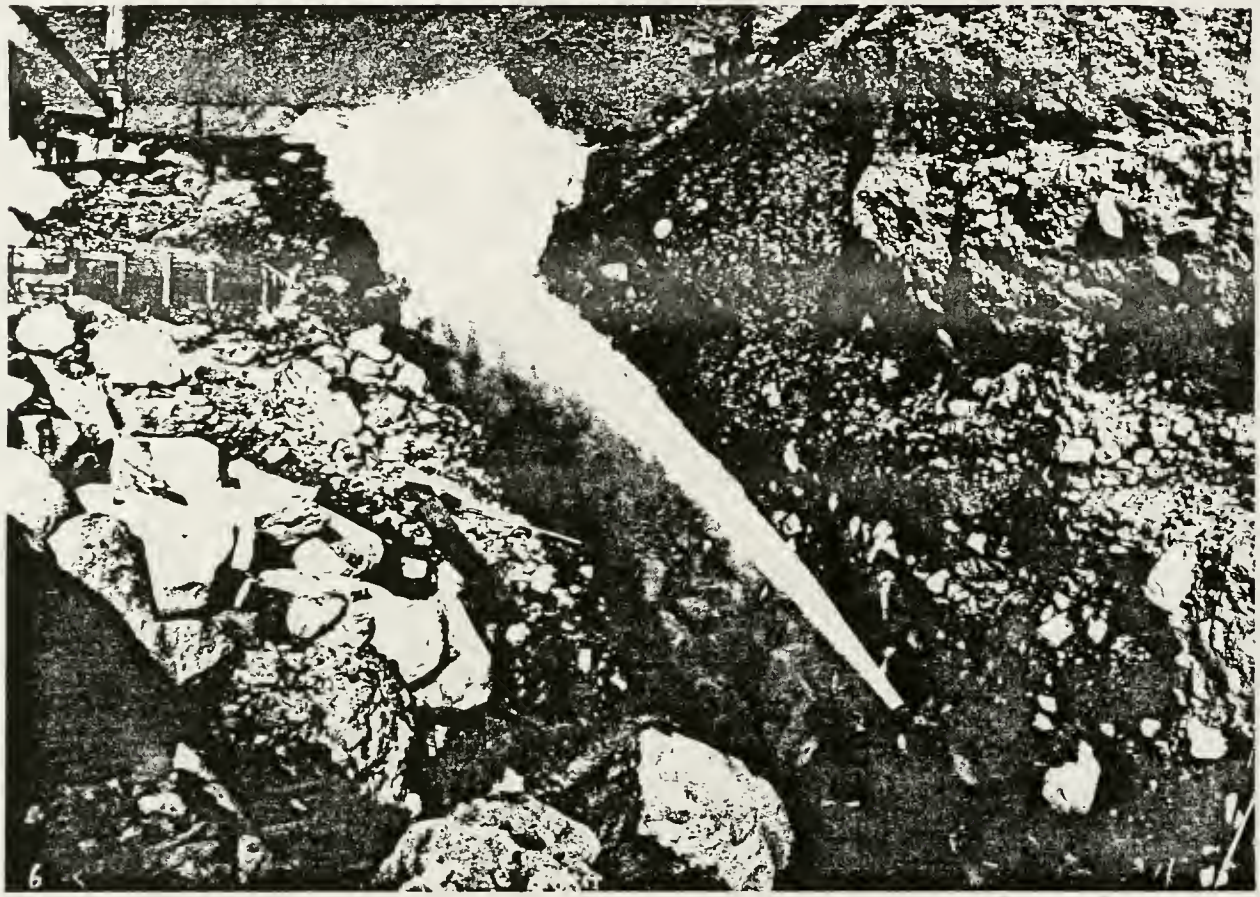

Figure 9. Major Eaton's hydraulic giant in operation at Bear Gulch, ca. 1884. (Courtesy of Bill and Doris Whithorn, Park County Museum, Livingston, Montana.)

Figure 10. Hydraulic placer cut on east side of Bear Creek, 1.5 miles south of Jardine townsite. (This is located outside project area.)

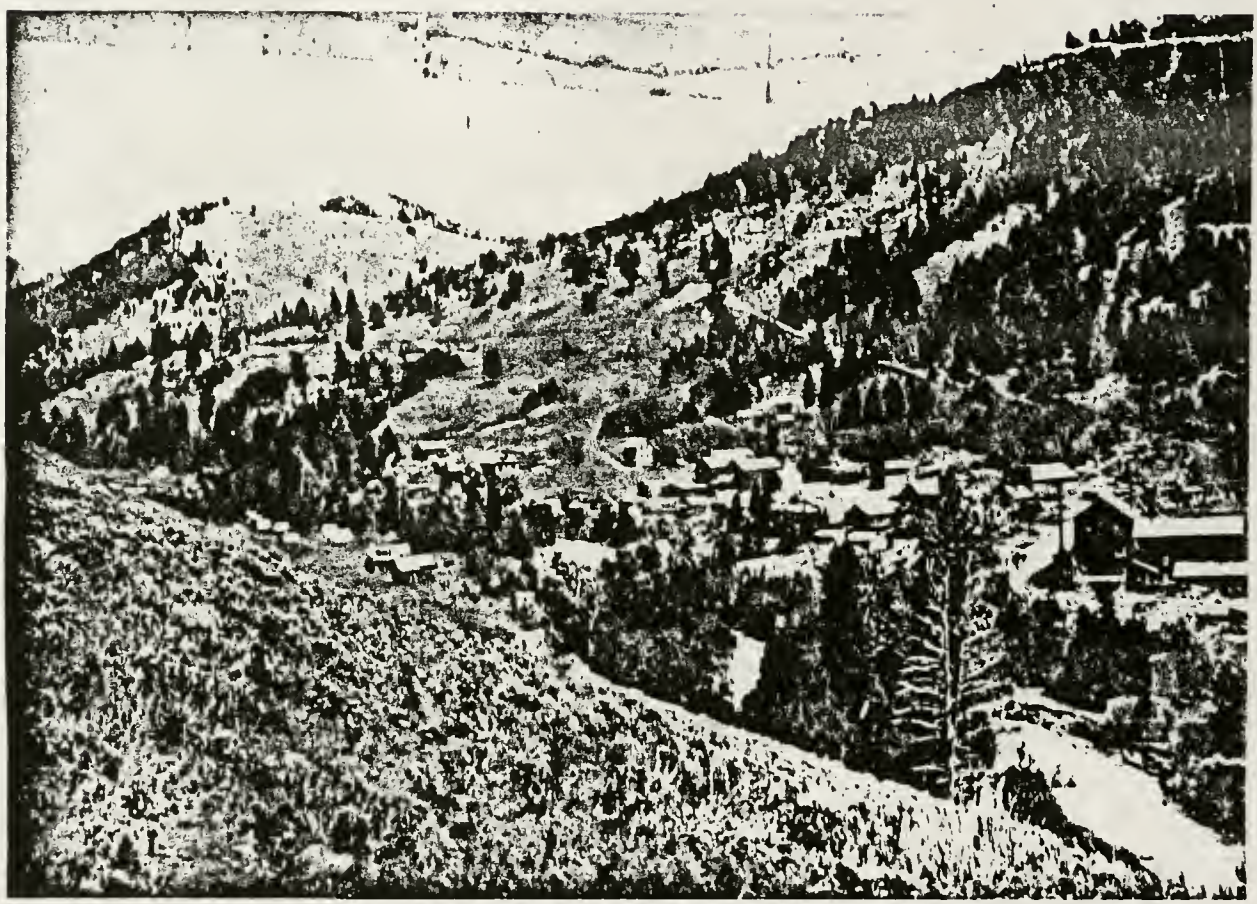

Figure 11. Jardine, Montana, 1898. Arrow indicates Major Eaton's stamp-mill with additions by Edgerton and Jewell of Helena. (Photograph courtesy of Bill and Doris Whithorn, Park County Museum, Livingston, Montana.)

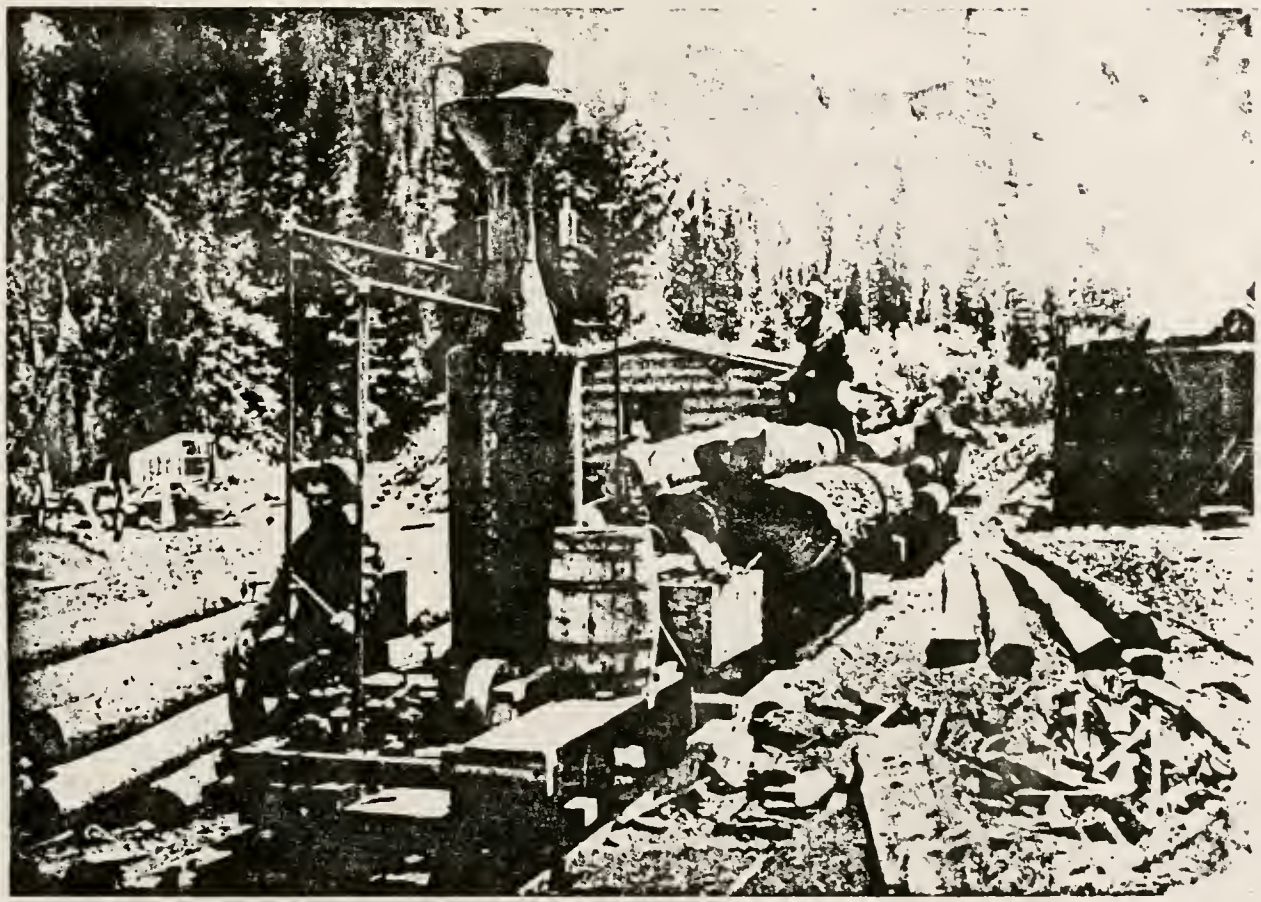

Figure 12. Bear Gulch sawmill, ca. 1895-1899. (Photo courtesy of Bill and Doris Whithorn, Park County Museum, Livingston, Montana.)

in Figures 13 and 14, arrived in the Bear Gulch camp on July 28, 1898 and instituted a frantic pace of promoting activity that was to transform the small Bear Gulch camp almost overnight.[161] The Livingston Enterprise described Harry Bush in the following manner:

> It was at once evident that he possessed all the zeal and enthusiasm for the establishment of a foundation for the mining industry of Bear Gulch, one that could breast any of the former difficulties which had existed there previously.[162]

When Bush arrived in Bear Gulch there were four log buildings and the old Eaton Mill and tramway. Within a year there were 130 new buildings, including two hotels, three mercantile establishments, office buildings, a mine company office, a guest house, a school and work started on a new mill. A water system and telephone service soon followed.[103]

Bush organized the Bear Gulch Mining Company which was incorporated on August 17, 1898.[164] The officers of the company were Harry Bush, President; O.A. Tibbitts, Vice President; A.C. Jardine, Secretary; Robert Bush, Treasurer; George O. Freeman of Helena, Attorney; J.E. Steward, Assayer; C. F. Pearis, Engineer; U.S. James, master mechanic and Thomas Rahlins, Mine Superintendent.[165] The principal stockholders and the primary sources of Harry Bush's financial backing were from St. Johns, New Brunswick and included the Blair Brothers, bankers; A.X. Wilson, Manager of the Bank of Nova Scotia; W. Malcolm McKay, lumber merchant; W. A. Thompson, capitalist and the Merritt Brothers, wholesale merchants. The Company was capitilized at $1,000,000 and shares issued at $1.00 a piece. Bush owned 50,858 shares, Jardine owned 141,659 shares and Alfred Blair owned 163,908 shares.[166]

Bush immediately began acquiring lode and placer mining properties. He bonded the Legal Tender Mine of the First National Bank of Helena for $150,000 and purchased the Sowash from Red Sowash; the Revenue from George Phelps; the Keats, West Point and W.W. Dixon from George Welcome and the Uncle Joe Placer from Joe Brown.[167] Excavation for a new mine office building and assay office were started. Bush had a 3000 foot ditch constructed to furnish water for hydraulic mining operations on the Uncle Joe Placer and he put his master mechanic, U.S. James and his engineer, C. F. Pearis to work on modernizing the old Eaton-Edgerton-Jewell mill. This mill was increased from ten to twenty stamps, two Frue vanners and three James tables were installed.[168]

Mining activity started immediately on the recently purchased claims. Two crosscuts were driven on the Sowash, a tunnel on the Keats and a tunnel on the Revenue. Nearly 200 men were now at work earning wages of $3.00 to $4.00 per day. The Livingston newspapers throughout this time period were enthusiastic promoters of Harry Bush and the Bear Gulch Mining Company.[169] The Livingston papers, then weekly, carried news of developments at the Bear Gulch camp in every issue. The Livingston Post of April 27, 1899 carried a front page headline that said "Bear Gulch a Second Butte, Wealth Without End."[170]

Bush's connections with capitalists in Canada during this time period was clearly well developed. The Canadians placed all of their stock under the control of A.C. Jardine as trustee and he was told to proceed with development work and "spend money like smoke if necessary".[171]

Figure 13. Harry Bush, ca. 1899. (Photograph courtesy of Bill and Doris Whithorn, Park County Museum, Livingston, Montana.)

Figure 14. Adeline Bush, ca. 1899. (Photograph courtesy of Bill and Doris Whithorn, Park County Museum, Livingston, Montana.)

Mining and milling operations were described in the Livinston papers in some detail. The old Eaton-Edgerton-Jewell mill had a crusher and twenty stamps. Gold was caught with mercury as it came from the stamps. Finer concentrates were elevated into sizing boxes through which water works with an undulating motion distributing it over the three James tables and the two Frue vanners.[172] It was claimed that $400 was recovered every twenty-four hours from the coarse plates below the stamps.[173] Concentrates were then shipped to smelters in Butte for some period of time. During the fall of 1898, Bush expressed interest in remodeling and reopening the McCauley Mill located between Jardine and Crevasse. During this period several high-grade ore deposits were located during development of the So-wash and Legal Tender mines. Bush now ran into problems with claim jumpers. A group of men led by Patrick Dougherty had filed claim locations on the properties purchased by Bush and his partners. This was to hurt Bush's development plans for it deprived him of needed rich ore for his mill. This culminated in Dougherty's cabin being dynamited by unknown parties and numerous counter charges and claims being filed in Livingston courts.[174] It would take Bush nearly a year to settle these problems.

In March of 1899, Bush laid the foundation for his Revenue (Red) stamp mill, with a ground area of 93 x 120 feet and a height of 103 feet. The foundation of this building contained six hundred perch (perch = 1 cubic yard) of stone and required 400,000 feet of lumber. U.S. James appears to have been the designer of this mill and he made use of gravity in developing the mill so the entire operation could been run by just a few men.[175] A five hundred foot tramway ran from the mine to the mill and discharged into a Cammett crusher which pushed it into a 500-ton pocket. The ore was then fed into eight batteries of five stamps each by eight automatic feeders. Eight plates then caught the free gold. The rest of the pulped ore proceeded to James tables and vanners and then into a sampling pit. This mill, although modified over the years, still stands in Jardine. This mill was finished in December of 1899 and Bush celebrated with a Christmas party at which 700 guests were entertained by a twelve piece orchestra and fed roasted buffalo.[177] The newly completed Revenue mill is shown in Figure 15.

During this period, Bush had problems obtaining ore with sufficient value to run since his most productive mines were tied up in litigation. He continued to process low-grade ore in his mill and problems with other members of the Bear Gulch Mining Company developed. James Stuart, the company assayer, asked Bush how he could keep running such ore at a loss. Bush replied,

> Nothing else to do, got to keep that mill goin if we have to feed it with pine stumps. Can't sell stock with an idle mill, can we? That skunk Dougherty and his gang have jumped the Legal Tender, but we will put the kibosh on that pretty soon, then we'll have plenty of good ore. I'm goin to Chicago to sell stock. Whatever you fellows do or don't do, keep that old mill goin day and night. Your Uncle Harry know what he's doin an' don't you for a holy minute forget it![178]

Figure 15. Revenue Mill, Jardine, Montana (ca. 1899-1900). (Photograph courtesty of Bill and Doris Whithorn, Park County Museum, Livingston, Montana.)

Bush was constantly traveling, selling stock and raising capital. In the period between the summer of 1898 and the summer of 1899, Bush incurred an indebtedness of nearly a $1,200,000 and internal dissension between himself and other company people developed. It appears that Bush and Jardine were at odds over Bush's spending habits. To such critics, Bush replied,

> Bosh, Cecil Rhodes didn't set down on his rump waitin fer things to happen did he? He made things happen! You jest set tight an' watch your Uncle Harry's smoke! And there was plenty of that same smoke.[179]

A split in the Bear Gulch Mining Company developed and Bush broke away and formed the Revenue Mining Company, incorporated in Helena on June 21, 1899 listing Harry Bush, E. T. Wilson, B. C. VanHouten, Thomas Rahlins and Robert Bush as officers and majority stockholders.[180] He also formed the Bear Gulch Mercantile and Land Company, incorporated on June 30, 1899 with George Welcome, Harry Bush, G. O. Freeman and H. J. Miller as trustees and shareholders.[181] The Revenue Mining Company was to operate the Bush mining properties while the Mercantile and Land Company proceeded to open a general mercantile store, sell lots, and build cottages. Bush acquired options on new mining properties and continued construction of the Revenue Mill. He also organized two other mining companies incorporated on June 21, 1899 as the King Solomon Quartz and Placer Mining Company and the Empire Mining Company with the same officers as the Revenue Company.[182] The King Solomon and Empire Company operated in close association with the Revenue.

By the summer of 1899, Bear Gulch now renamed Jardine, had two distinct mining groups operating in opposition to each other. These were the old Bear Gulch Mining Company, still under the direction of A. C. Jardine, and the new Bush Company. Bush continued frequent trips to Chicago, Milwaukee and New York trying to raise capital. Work continued on the new mill, but Bush failed to adequately develop his mines for sources of ore. In June of 1899, Bush took an option to purchase part of the Gardiner townsite and proposed to build a standard gauge railroad from Cinnabar to Gardiner and then to Jardine.[183] On Monday, June 19, 1899, Bush traveled to Butte and met with President Mellen of the Northern Pacific Railroad. An agreement was reached. The Northern Pacific would extend the railroad to Gardiner for $28,300 provided that Bush paid the same amount to the Northern Pacific within 30 days. The Northern Pacific would own and operate the line and fix rates. When volume from the Jardine mines reached proportions specified in the agreement the railroad would pay back the money to Bush and his associates.[184]

Bush also took an option to purchase the St. Julien Mine and Mill in Emmigrant Gulch and become associated with A. W. Miles of Livingston in the Montana Wonder Company which was organized to promote "The Petrified Man" and was capitalized at $26,500.[185] He also became associated with W. A. Bucke, a Canadian mining engineer who had been purchasing mining claims in the Crevasse District and was also associated with the Bear Gulch Mining Company. Bush hired W. A. Bucke, a mining engineer from British Columbia to be his mine superintendent and sent him to the Drumlummon Mine at Marysville to study new metallurgical techniques.[186] Tunnels and drifts were driven into Eaton's old placer ground south of town and a rich strike was located at the Sowash during the summer of 1899. Plans were made to erect cottages for rent and

cottages for rent and work continued on several buildings including the Bear Gulch Hotel operated by Mr. Jervis of London. Figures 16 and 17 show the Bear Gulch Hotel shortly after its completion in 1899.

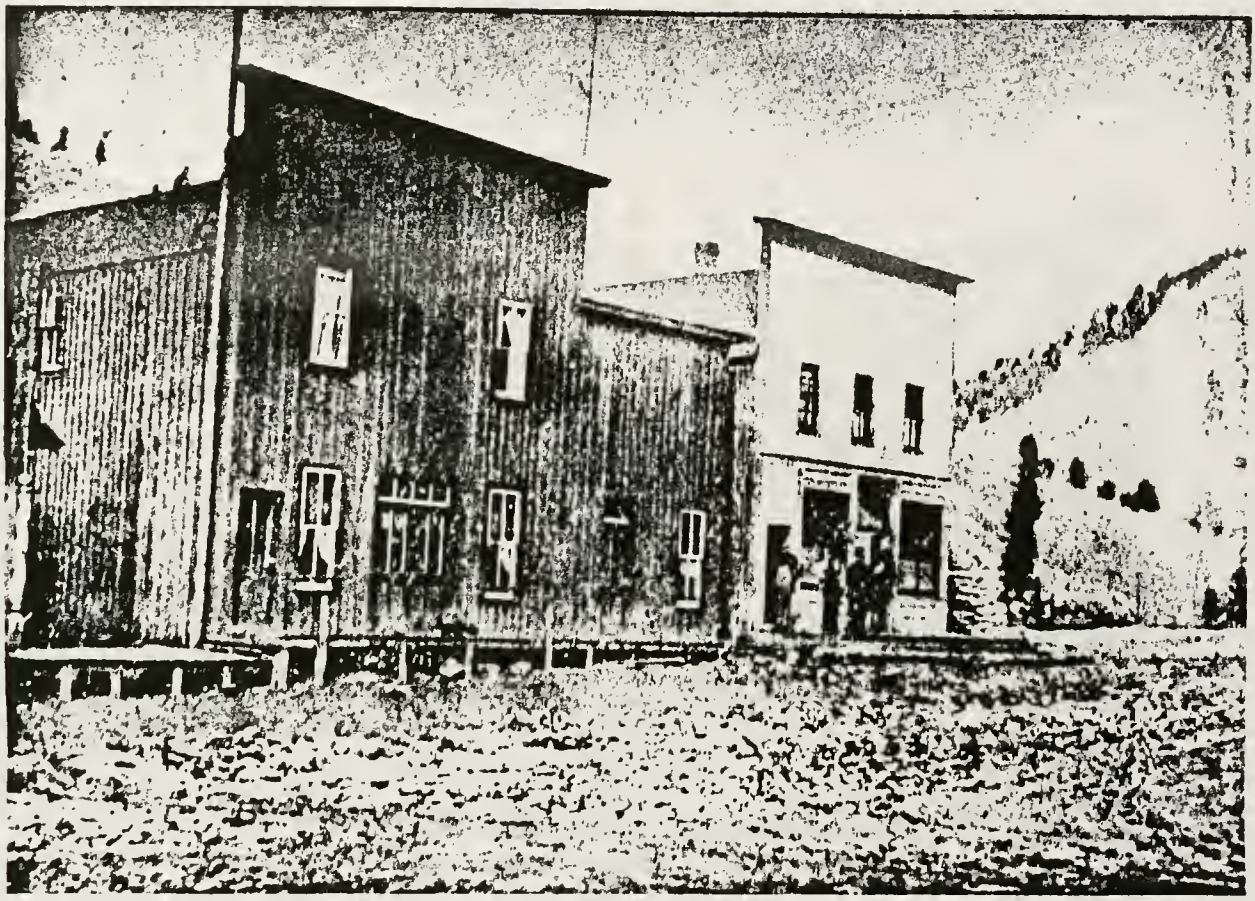

Figure 16. Bear Gulch Hotel and Mercantile store, Jardine, ca. 1899 - 1900. (Photograph courtesy of Bill and Doris Whithorn, Park County Museum, Livingston, Montana.)

Figure 17. Bear Gulch Hotel, Jardine, ca. 1899-1900. (Photograph courtesy of Bill and Doris Whithorn, Park County Museum, Livinston, Montana.)

Figure 18 is a view of the main street of Jardine in 1899-1900 looking north and Figure 19 shows Harry Bush examining the underground workings at the Sowash Mine. Figure 20 shows the Bush guest house recently completed in 1899 with Mr. and Mrs. Bush on the front porch.

Throughout the summer and fall of 1899, the newspapers in Livingston continued to promote Harry Bush and Bear Gulch with such headlines as:

> It's a sure winner, mining problems solved in Park County[187]
>
> Bear booms with Bush[188]
>
> Anaconda has Marcus Daly, Bear Gulch has Harry Bush[189]
>
> Harry Bush is a hustler and some day he will show results[190]
>
> Bear a bonanza, the mushroom not in it with Jardine the camp on Bear Creek promises to be a second Cripple Creek[191]

By the late fall of 1899, development work had continued to progress. Three thousand feet of tunneling had been completed in the Revenue Mine. Figure 21 shows miners at work in the Revenue Mine and Figure 22 shows miners by portal. By this time an electric light plant and water system had been completed. Work continued on the Revenue Mill tramway which is shown in Figure 23.

In December of 1899, a three day trial test was run on ore in the Revenue Mill which recovered $3,000 of gold[192] and predicted yearly revenues of $750,000. On December 16, Bush associate, M.A. Bucke was killed in a carriage accident while traveling from Jardine to Gardiner with Alfred Blair, one of Bush's financial backers from St. John's New Brunswick. Bucke was 31 years old at the time, a member of the Canadian Geological Survey and former manager of the Arlington Mine in Nelson, British Columbia. Bucke was apparently instrumental in bringing Canadian capital to Bear Gulch.[193] He was associated with Bush in the Revenue Mining Company for a while then resigned and became manager of the Bear Gulch Mining Company.

In December of 1899, the discovery of tungsten ores in the form of scheelite was reported at Jardine in the Revelation Mine by James Stuart, assayer for Harry Bush. It would be several years before this ore was commercially exploited.[194] In the same month, Bush's New Revenue Mill was completed under the supervision of U.S. James. James had come from Helena where he had been associated with the Stedman Foundry operated by G. M. Stedman and Nicholas Kessler from 1888-1894. In 1894, James became manager of the Helena Iron Works and president in 1895. He organized the James-Bell Concentrator Table Company in Helena on January 21, 1899 to engage in the manufacture and sale of mining machinery.[195] He patented the James Concentrating Table and was issued Patent # 633,265. James later moved east and established the U. S. James Company Inc. in Newark, New Jersey and continued his manufacture of mining equipment.[196]

Figure 18. Main street of Jardine, ca. 1899-1900, showing freight wagons. (Photographs courtesy of Bill and Doris Whithorn, Park County Musuem, Livingston, Montana.)

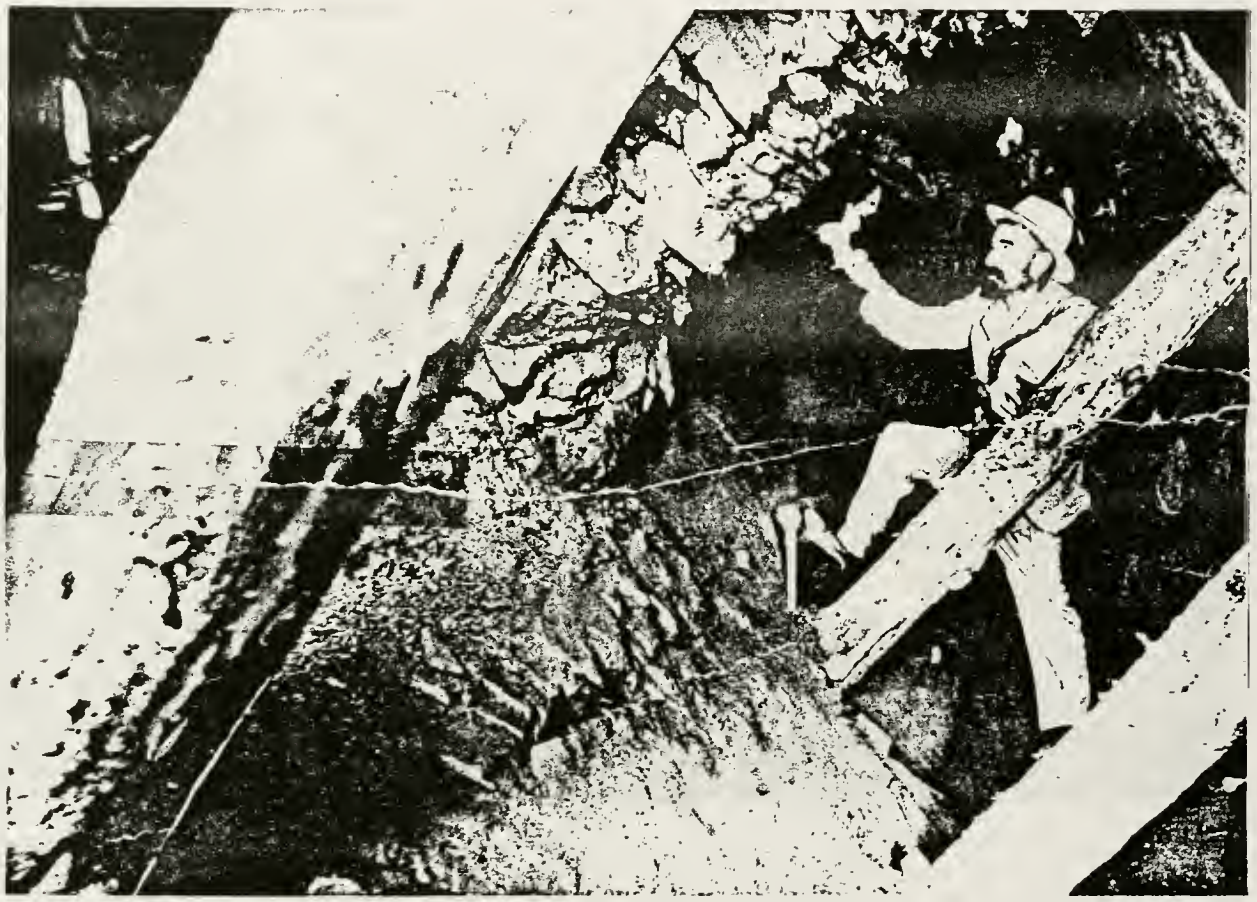

Figure 19. Harry Bush examining underground working at Sowash Mine, ca. 1899-1900. (Photograph courtesy of Bill and Doris Whithorn, Park County Museu, Livingston, Montana.)

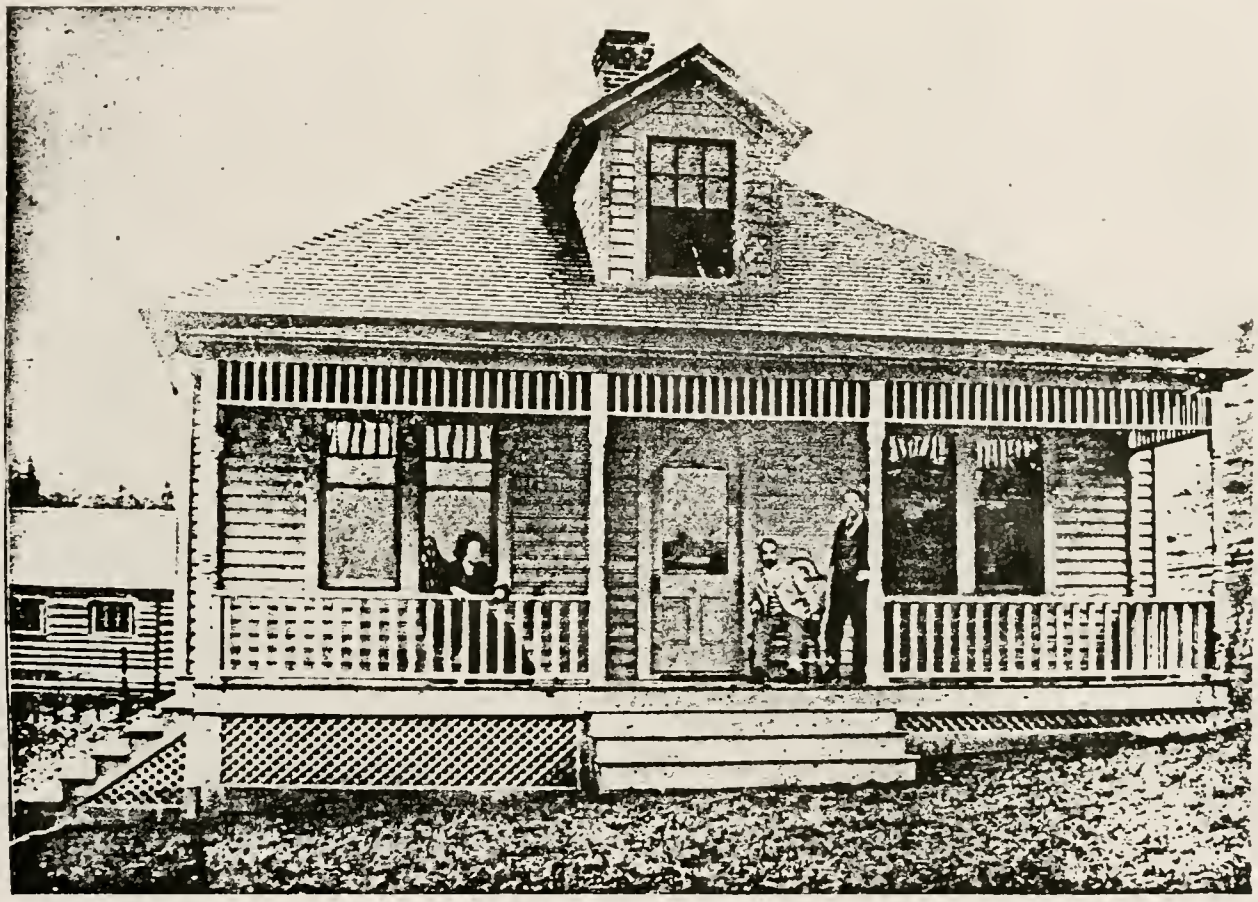

Figure 20. Bush guesthouse at Jardine, 1899. (Photograph courtesy of Bill and Doris Whithorn, Park County Museum, Livingston, Montana.)

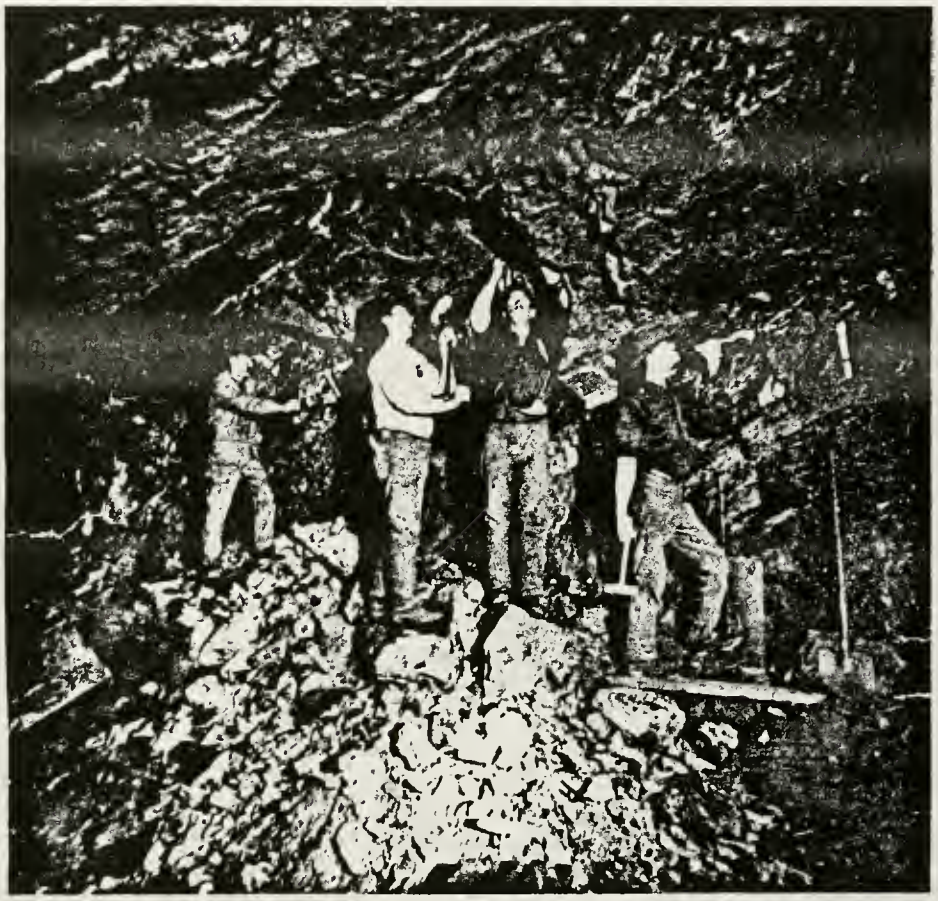

Figure 21. Miners at work in Revenue Mine, single-jacking and double-jacking, ca. 1899-1900. (Photograph courtesy of Bill and Doris Whithorn, Park County Museum, Livingston, Montana.)

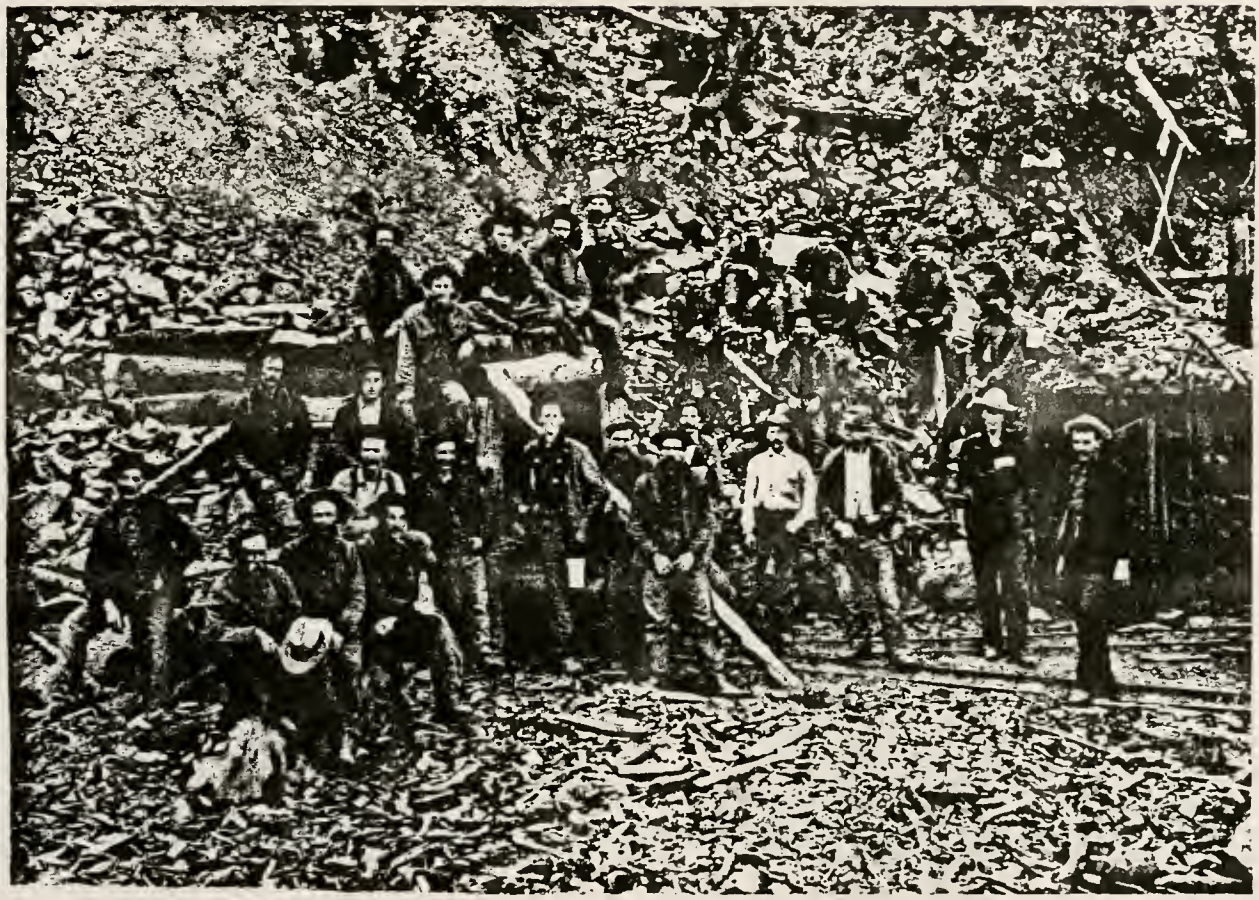

Figure 22. Miners ca. 1899 at mine portal on Mineral Hill. (Photograph courtesy of Bill and Doris Whitehorn, Park County Museum, Livingston, Montana.)

Figure 23. Revenue tramway, ca. 1899. Building in distance is not mill, but a ore holding structure located up the hill and east of the mill. (Photograph courtesy of Bill and Doris Whithorn, Park County Museum, Livingston, Montana.)

In January of 1900, less than a month after the Christmas party that celebrated the completion of the Revenue Mill, Harry Bush's world of mines, mills, and high finance started to collapse. Some of his major creditors including the First National Bank of Butte and Anton Holter's Hardware Company of Helena put pressure on Bush for payment of debts. Bush was forced to place his properties in receivership to George O. Freeman for the benefit of his creditors.[197] This happened while Bush, Freeman and George Welcome were in Livingston where Bush was organizing the Bush Consolidated Mining and Investment Company to conduct the business of mining, concentration and smelting of ores and to deal in townsites and town properties. Five million shares were to be issued at twenty-five cents per share. The officers of the new company and primary stockholders were Harry Bush (Vice President), Frank Henry (President), George Welcome (Treasurer), H. T. Torey (Secretary), and George Freeman.[198]

Bush expresssed confidence in the paper that his assets would cover any small liabilities.[199] George Freeman told a newspaper reporter in Livingston that "90 days of Revenue Mine ore will pay debts off".[200] The next six months became a flurry of activity as Bush traveled all over the country trying to raise capital and save his mining operation.

In early February of 1900, Bush traveled to Milwaukee to meet with potential investors.[201] At the same time he tried to consolidate his company and holdings with the Bear Gulch Company now lead by A.C. Jardine in order to lift his indebtedness and operate his mines and mill. This failed because A. C. Jardine and the board of the Bear Gulch Mining Company offered Bush only $85,000, a sum he thought too low.[202] Also in February of 1900, Thomas Swindlehurst of Livingston was appointed receiver for the Bush properties to replace George Freeman. Early March of 1900 found Bush in St. Johns, New Brunswick negotiating for new capital. He telegramed his people in Jardine that things looked favorable.[203] On March 14, 1900, Bush returned to Jardine with Alfred C. Blair Jr., who was the Canadian Commissioner of Railways, to examine the properties.[204] After staying two weeks, Bush and Blair left for Canada to make first arrangements for starting operations at the Revenue Mill and mines.[205] Bush continued to make trips to Canada over the next two months trying to raise capital. He apparently was unsuccessful.

In June of 1900, another mining company, the Gold King Mining Company was incorporated in Jardine. The company was capitalized at $1,500,000 and listed the following men as officers: Frank Henry of Livingston, C. Van Houten of Helena, E. T. Wilson of Helena, George Phelps of Jardine and Alex Livingston of Livingston.[206] Bush was listed as a witness on the incorporation papers but was not part of the company. This company absorbed the Revenue Mining Company and Bush Consolidated Mining and Investment Company.

In July of 1900, with Bush's creditors pressing him, the matter of disposition of his properties went into court at Livingston. Judge Frank Henry listed two bids for the Bush properties, one from A.C. Jardine and the Bear Gulch Gulch Mining Company for $65,000 and one from Harry Bush for $80,000. Judge Henry disapproved Jardine's bid and accepted Bush's bid apparently because George Welcome and other Bush creditors objected on the grounds that Jardine's bid was conditional in that it reserved a privledge for Jardine to settle the indebtedness of Bush with the First National Bank of Butte instead

of satisfying other creditors.[207] Bush was given ten days by Judge Henry to deposit $10,000 as evidence of his good intentions. Bush did not do this and Judge Henry ordered the properties of Harry Bush advertised for sale in the Livingston Enterprise, Butte Miner and The Anaconda Standard.

On August 18, 1900, Bush's properties including the Revenue Mill, 72,000 shares of Bear Gulch Mining Company stock, 275,000 shares of King Solomon Quartz and Placer Company stock, electric light plant, water plant, guest house and mine office buildings, were sold at auction in Livingston by Thomas Swindlehurst, receiver.[208] E. B. Weirick submited the only bid of $60,000 on behalf of the First National Bank of Butte. This bid was accepted with a down payment of $6,000.[209]

Bush had spent an immense amount of money in a short period of time before his properties could make any returns. His creditors forced him into assignment of a receiver and he was unable to raise the necessary capital to remove his indebtedness. In October of 1900, Bush and wife left Jardine and moved into Livingston.[210] In November, Bush was busy at work promoting mines again, this time in the Independence Mining District at the South Boulder River for a London syndicate. The newspaper reported that Mr. Bush believed the Boulder properties were good and that he would bring that country to the notice of the mining world.[211] When interviewed by a reporter and asked if he would spend as much money on the Boulder mines as he did on Bear Gulch, he replied, "and a bit more".[212]

Meanwhile, back in Jardine, the Bear Gulch Mining Company held their annual stockholders meeting. They reported $250,000 in ore taken out of Sowash in the past year. New directors elected were A. C. Jardine, B. C. Vanhouten of Helena, A. J. Davis of Butte, John Thompson of St. Johns, New Brunswick, Alfred C. Blair of St. Johns, New Brunswick, and W. G. Merritt of St. Johns, New Brunswick.[213] They planned on large expenditures in the coming year.

November of 1900, found Harry Bush and Alex Livingston in Butte trying to get a $50,000 bond on the Revenue Mill and taking charge of property again. They brought in D. A. Buchanan of Tacoma, a mining engineer to make the mill operational and hired James Hall to operate the Robinson claim to provide ore for the mill.[214] Mr. John Adams of London arrived in Montana to look over Jardine properties and Boulder properties for the Nimrod Syndicate of London. He stated that "Bush will be in charge again soon".[215]

In December, Livingston and Bush with the Revenue Mill and the Robinson claim under bond from the First National Bank of Butte, traveled to Spokane to raise capitol. The $18,000 bond on the Robinson claim was due in June of 1902 and the $50,000 bond on the Revenue Mill was due on February 21, 1901.[216]

On January 10, 1901 the Robinson Gold Mining Corporation was incorporated in Helena and capitalized at $1,500,000.[217] Bush and Livingston had succeeded in raising capital from Spokane mining men. The incorporators were Frank S. Taggart and J. E. Lancaster of Spokane. The Company directors were listed as Harry Bush, Alex Livingston and John Moynahan of Spokane. The Livingston newspaper headlines spoke again, "Bush is back, Bright for Bear again".[218] The Robinson Company immediately hired twenty men and put them to work

driving two tunnels on the Robinson mine. The Company also planned to purchase the King Solomon and Germania lodes.

The Robinson Company made application dated January 21, 1901 to the Secretary of Interior for a franchise to build an electric railroad from Cinnabar to Bear Gulch.[219] In late January of 1901, Harry Bush and his wife moved to Spokane, Washington. Bush was to run the Robinson Mining Company headquarters in Spokane. On leaving, Bush told a Livingston Post reporter, "I will visit Bear Gulch frequently, I will not desert Park County".[220] However, in late February 1901, Bush, apparently finding Spokane more congenial wrote a letter to the Livingston newspaper

> The want of enterprise and lack of push among the people of Livingston will tend to keep that city in background for a time. However I shall not forsake Bear Gulch which needs a few live men[221]

In February of 1901, the Robinson Mining Company elected Frank S. Taggart (President), Alex Livingston (Vice President) and Harry Bush (Secretary). Mr. Taggart was a senior partner with Cheney and Taggart, stockbrokers of Spokane. In early March of 1901, Colin McIntosh a mining man from Spokane represented an English syndicate interested in purchasing the Robinson Mine.[222] While the records are not clear, the Robinson Mining Company was unable to pursue mining activities in Jardine due to a lack of capital. Harry Bush remained in Spokane, involved in mining activity in Washington and lobbying for changes in Washington mining laws. The last news came in a letter he wrote to the Livingston newspaper in 1907.

> Do you realize your negligence is not advancing information to the financiers, speculators and investors not only of the U.S but of the world? [223]

With the exception of this letter no more is heard of Harry Bush after 1901. Dr. James Stuart, former assayer for Harry Bush wrote of him in 1935:

> The life of the new company was short, due to insufficient capital, and a receivership followed. Bush's star was on the wane. The mill, the little town of cabins and other of Bush's boom developments are still in use, a monument to the undefeatable optimism, the monumental bluff and the enthusiastic and unbounded faith of a would-be disciple of Cecil Rhodes. It is earnestly hoped that, on the other side of the Great Divide, Bush has discovered and enjoys bigger, better and lasting mines of gold than any he ever promoted on this ever changing earth.[224]

With the departure of Bush from the Jardine scene, new promoters and new mining companies emerged. On January 14, 1903 the Bear Gulch Gold Mining Company was incorporated with Alex Livingston, George Welcome, John Jervis and others as officers and stockholders. This company did not obtain sufficient capital and lasted less than a year.

In the next major development at Jardine, a new promoter, Harry M. "Cabbage Ryan" emerged who had previously been involved with Harry Bush in business in Jardine. Ryan with the financial assistance of Peter Kimberly of Sharon, Pennsylvania and later Kimberly, Arizona acquired most of the properties owned by Bush's Companies and the Bear Gulch Mining Company.[225] Kimberly was an interesting mining speculator and financial backer. Utilizing $3,000,000 left to him by his father, Kimberly engaged in numerous successful mine development projects including the Chandler iron mine in Minnesota, the Northern Coal and Coke Company in Kentucky, the Honerine silver lead mine in Utah, the Annie Laurie gold mine at Kimberly, Arizona and the Balaklala mine in California.[226]

Kimberly and Ryan organized the Kimberly Montana Gold Mining Company which was incorporated in Arizona of November 15, 1902 and filed in Montana on July 1, 1904. This company consolidated all of the mining properties and buildings that had been owned by the Bear Gulch Mining Company, the Revenue Mining Company, the Bush Consolidated Mining and Investment Company, the Bear Gulch Mercantile and Land Company, the Gold King Mining Company and the Bear Gulch Gold Mining Company. W. H. Barnaby was elected president and A. H. France secretary. Barnaby, France, A. H. Harrington, Joseph Allison and "Cabbage" Ryan constituted the board of directors.[227] Their corporate office was in Arizona with the principle place of business in Jardine.

Under the direction of Ryan, the company began large scale activity in Jardine. The company built a large cyanide plant (burned 1948), purchased machinery, planned the construction of another 40 stamp mill, installed a hydroelectric plant in Bear Gulch near the Yellowstone River, operated the Revenue Mill and started an ambitious plan of mine development. In a short period of time revenues did not keep up with expenditures and disagreements developed amongst the stockholders. Ryan organized the Montana Consolidated Company to take over debts and properties. The Kimberly-Montana Gold Mining Company failed in 1909 due to internal friction, financial problems and legal difficulties over mine claim ownership.[229] Miles Finlen of Butte was a member of the board in 1903. The Montana Consolidated Gold Mining and Milling Company headed by Ryan functioned primarily as a stock selling company.

The discovery of scheelite at Jardine is credited to the Kimberly-Montana Gold Mining Company. It appears, however, a German mine superintendent named Wortenweiler recognized the scheelite mineral about 1904 and shipped some for his personal account in 1905.[229] Apparently a large amount of scheelite ore lay on the mine dumps, discarded by the miners of the earlier days who had trouble separating gold from the scheelite on the old Vanner concentrate tables. Ryan found out about the scheelite and eventually had tests made on it at the East Helena smelter. The company shipped several hundred tons in 1907. Little mining was done under Ryan's Montana Consolidated Gold Mining and Milling Company but the company did pay some dividend through stock sales and manipulation. Ryan at this time helped organize the Yellowstone Portland Cement Company and made plans to build a cement plant at Gardiner. Between 1907 and 1913 various law suits involving stockholders of the Kimberly and Montana Consolidated Company went through the courts. The mining properties and buildings at Jardine were eventually sold at a Sheriff's sale in 1913 to Mr. Hutchins representing Chicago investment groups.[230]

The Jardine Gold Mining and Milling Company, incorporated in Arizona in 1914 and in Montana filed in 1917, acquired the Jardine properties in 1914 through a bond holders foreclosure sale.[231] The new company had W. S. Hunnewell of Arizona as president, Harry C. Bacorn of Butte as secretary. The company offices were in Butte. A prolonged legal battle over property ownership lasted for three years. Harry C. Bacorn of Butte joined by his brother F. W. Bacorn took charge of operations in 1916. Extensive mine development and improvement of equipment took place. The hydroelectric plant constructed by Kimberly-Montana Company was put back into operation and mining of gold and tungsten ores commenced.

In 1921, the property was reorganized under the Jardine Mining Company and refinanced. Mr. Hunnewell left the group at this time but Harry Bacorn stayed on as general manager and later vice-president and president of the Jardine Mining Company until 1936.[232]

The Jardine Mining Company developed new ore bodies at the south end of Mineral Hill and stepped up production to 200 tons per day. Nearly 200 men were employed at the mines through the 1930s. Figure 24 shows miners of the Jardine Mining Company by the compressor house in the 1920s. It was known that ores from the Jardine mine were rich in arsenopyrite, a source of arsenic. After World War I there was an increased demand for arsenic as a insecticide to combat the boll weevil in the cottonfields of the south. Test concentrates shipped to the smelters in Tacoma in 1922, averaged nearly 40% arsenic trioxide.[233] Bacorn pointed out the value to the mining company of recovering arsenic from the ores. The company built an arsenic plant in 1923 at a cost of $125,000 which still stands today. The purpose of this plant was to produce crude and refined arsenic trioxide from arsenopyrite gold ore concentrates.[234] Profits were made on the arsenic ores run through the new plant until when decreased prices for arsenic caused a shut down of the plant in June of 1927. The arsenic palnt was constructed and designed by Charles R. Wraith, metallurgist for the Anaconda smelter in Anaconda.[235] Large quantities of arsenic ore were purchased by the United States Government and Montana counties. Jardine was one of the largest arsenic producers in the United States through the early 1920s. In 1925, the Jardine Mining Company paid a 1/4¢ dividend on each of its 2.1 million stock shares.[236]

After a three year shutdown, the Jardine Mining Company started up its operations again in 1930 by starting to develop the tungsten-sheelite ores. The mines did not operate at full capacity again until 1933. By 1936, New York investors acquired the company and retained the same name. Mr. William Hax of New York became president and took over operations also as general manager.[237] Selective mining of gold and tungsten ore continued. The production of arsenic was stopped in 1936 because the market was poor. In the late 1930s and early 1940s an extensive mine development program was started, mostly in that area of the mine east of the Bear Gulch fault.[258] Extensive diamond drilling was done at this time.[239] Milling capacity was increased to 300 tons of ore daily. In 1941, the mill was redesigned to increase recovery particularly of tungsten. In 1942, war time restrictions on mining operations shut down all operations in Jardine.

Figure 24. Miners of the Jardine Mining Company in the 1920s by the compressor house. (Photograph courtesy of Bill and Doris Whithorn, Park County Museum, Livingston, Montana.)

During the war years, a demand for arsenic developed and in 1944, the Jardine Mining Company took out loans for $250,000 from the Small War Plants Corporation, a division of the RFC to remodel the mill to meet government contracts for white arsenic. The mill reopened in early 1944, and arsenic was delivered to the Metals Reserve Company until late in 1945 when government contracts were cancelled. Without the government contracts for arsenic the Jardine Mining Company was unable to meets its loan obligation.

On May 8, 1948, a fire destroyed the cyanide plant and on July 15, 1948, the Jardine Mining Company shut down all operations.[240] In the late 1940s the Federal Government filed suit against the Jardine Mining Company for non-payment of the RFC loans and in turn, the Jardine Mining Company filed suit against the Federal Government for breach of contract for a total of $2,376,000. The court cases were to drag on for many years. In 1954, a Federal Court of Claims decided that damages should be awarded to the Jardine Mining Company and a referee should be appointed to adjudicate the damages.[241] It was hoped at the time that this would enable the Jardine Mining Company to repay its RFC loan and reopen the mines.[242] This did not happen and the Federal Government seized the Jardine properties and sold them at auction in 1964 to Mr. Richard B. Blankenship for $82,213.[243] Mr. Blankenship tried to develop a ski resort and camping complex in Jardine which were not successful. In the mid-1970s he sold most of the property to the Anaconda Company of Butte who undertook an extensive testing program. Approximately a year ago the Anaconda Company sold the property to the Homestake Mining Company which is now planning mine development operations.

Although the Bear Gulch - Jardine area has a mining history that spans nearly a century, its most productive years were between the early 1920s and the onset of World War II. Tables 1 and 2 illustrate Jardine Mine production between 1899 - 1943 that totalled nearly $5,000,000 in value. The production primarily from placer mining prior to 1899 is not known. The production of the Jardine Mine has been hampered over the years by promoters with money to spend but little practical experience in dealing with the low grade refractory ore deposit, claim ownership disputes, transportation problems and court litigation that shut down operations on numerous occasions.

Table 1.(page 1 of 2) Jardine Mine Production

Operation (year)	Ore Treated (short tons)	Gold (fine oz.)	Silver (fine oz.)	Arsenic (lb.)	Tungsten (lb.)	Copper (lb.)	Lead (lb.)	Value
Early Operations	-	-	-	-	-	-	-	-
Bear Gulch Mining Co. (1899-1902)	26,400	26,900	3,120	-	-	-	-	$540,562
Kimberly-Montana Gold Mining Co. (1903-1908	36,586	11,782	4,366	-	400,000	-	-	$344,339
Jardine Gold Mining and Milling Co.(1917-1921)	27,537	6,418	1,623	-	65,162	73	1,292	$185,880
Jardine Mining Co.								
1922	36,883	7,834	1,325	-	-	-	-	$163,268
1923	44,429	8,048	995	773,091	-	-	-	$229,032
1924	49,172	9,983	1,346	1,677,000	-	-	-	$341,429
1925	69,409	14,182	1,511	3,262,650	-	-	-	$424,732
1926	24,586	5,356	626	3,711,590	-	-	-	$216,140
1927	40	110	13	-	16,000	-	-	$ 7,284
1928	1	4	-	-	-	-	-	$ 88
1929	-	-	-	-	-	-	-	-
1930	-	-	-	-	50,000	-	-	$ 24,154
1931	70	117	16	-	-	-	-	$ 2,426
1932	2,738	1,393	305	-	52,000	-	-	$ 41,834

Table 1.(page 2 Of 2) Jardine Mine Production

Operation	Ore Treated (short tons)	Gold (fine oz.)	Silver (fine oz.)	Arsenic (lb.)	Tungsten (lb.)	Copper (lb.)	Lead (lb.)	Value
Jardine Mining Co.								
1933	22,422	4,837	900	809,800	-	-	-	$142,480
1934	29,617	4,105	812	965,000	-	1,275	-	$160,513
1935	38,777	6,073	1,095	1,012,000	-	470	-	$222,655
1936	40,754	4,820	980	404,000	-	250	-	$173,186
1937	53,355	10,034	1,532	-	44,000	-	-	$364,454
1938	49,651	7,590	1,284	-	-	-	-	$266,480
1939	51,241	8,275	1,628	-	40,000	-	-	$310,167
1940	57,812	9,317	1,866	-	84,000	-	-	$398,702
1941	69,469	7,436	1,689	-	14,000	1,400	-	$271,024
1942	2,799	700	218	-	-	900	-	$ 24,764
1943	-	-	-	-	-	-	-	-
TOTAL	733,748	155,314	27,250	12,615,131	765,162	4,368	1,292	$4,855,593

Table from Seager, 1944

Table 2. Jardine Mine Production(Seager,1944)

Operations	Gold	Silver	Arsenic	Tungsten	Copper	Lead	Total
Early Operations	-	-	-	-	-	-	-
Bear Gulch Mining Company (1899-1902)	$538,934	$1,628	-	-	-	-	$540,562
Kimberly-Montana Gold Mining Co. (1903-1908)	$241,776	$2,563	-	$100,000	-	-	$344,339
Jardine Gold Mining & Milling Company (1917-1921)	$133,211	$1,690		$50,913	$ 9	$ 57	$185,880
Jardine Mining Company (1922-1943)	$3,137,849	$12,831	$479,398	$154,295	$439	-	$3,784,812
Total	$4,051,770	$18,712	$479,398	$305,208	$448	$57	$4,855,593

PART V

RESULTS OF INVENTORY

In total, two archeological sites and four historical sites were located and recorded by the field inventory. The two archeological sites are the Johnson Family site (24PA159) and Sargon's site (24PH340). The Johnson Family site (24PA159) was previously recorded by Forest Service personnel in 1970. This site was relocated, mapped, surface collected and tested for subsurface cultural deposits. Two historical sites, the Pine Creek Cabins (24PA410) and the Mineral Hill Cabins (24PA185) had also been recorded by Forest Service personnel. These sites were relocated and additional recording and historical research done on them. One new historic site, the Hanlon Hill Adits (24PA342) was located west of town on the west side of Hanlon Hill. The last historic site to be recorded was the townsite of Jardine (24PA339). While mentioned in general histories of the area, Jardine had never been given a site number and completely recorded. The site of Jardine includes the town area proper and the historic mining features on the west side of Mineral Hill.

PART VI

ARCHEOLOGICAL SITE NARRATIVES

Johnson Family Site 24PA159

Location: S1/2 NW1/4 SW1/4 section 17, T9S R9E Area: 5400 m^2

Elevation: 6160 ft. (1877 m)

Description: The Johnson Family site appears to be a prehistoric habitation site. It was first located by Forest Service personnel in 1970.[244] It is situated on a high terrace just south of Palmer Creek and east of Bear Creek (Figures 25-26). This terrace consists of alluvial deposits laid down by Palmer Creek and Bear Creek and glacial till deposits. The western edge of the site drops sharply down steep slopes to the Bear Creek drainage. A large portion of this terrace was plowed by the Johnson family when the area was part of a ranch operation. Broken pieces of farm machinery litter the site surface. Several water ditches were constructed across the site by the ranch operator in past years. Vegetation zones in the area consists of riparian at the north end of the site along Palmer Creek and open rangeland on the rest of the site. On-site vegetation consists largely of sagebrush, range grasses (needle and thread, grama) and wheat grasses that were introduced by the ranches. Scattered stands of Douglas fir and lodgepole pine are situated on the north and west end of the site. Soils on the site are fairly well developed and consist of dark brown alluvial soils and well-sorted glacial till deposits. Palmer Creek provides a water source and is located apprxomately 30 m north of the site. This site is located on private land and National Forest land.

Cultural Materials: Cultural items observed on the site locale include a agate corner-notched projectile point, a obsidian biface fragment, a quartzite spall chopper-scraper and several hundred small obsidian chert and agate flakes primarily the result of pressure retouched flaking (Figure 27). The agate corner-notched projectile point is characteristic of the Late Prehistoric period on the Northwestern Plains. Four tests pits (1 m^2) were placed on the site locale and excavated to a depth of 65 cm below surface. All test pits revealed subsurface cultural material to a depth of 65 cm below surface. Cultural materials from all test pits was very similar and included small pressure flakes of obsidian and chert. Small flakes of charcoal came from all test pits from just below surface to a depth of 65 cm b.s. No diagnostic artifacts were located in the test pits. The Forest Service personnel who located this site in the 1970s reported that projectile points diagnostic of the Paleo-Indian period had been collected from the site.[245] No evidence of projectile points characteristic of this period were located.

Cultural Activities Represented: This site appears to have been a hunting campsite at which completed tools were reworked and resharpened. The large number of small pressure-reduction flakes are suggestive of this. The presence of charcoal in all test pits would indicate a potential for small hearth features to be present at this site.

Chronological Placement: This site was utilized by cultural groups in the Late Prehistoric period. This is confirmed by the presence of a small triangular corner-notched projectile point characteristic of this period. The reported collection of Paleo-Indian period projectile points would add a considerable time depth to this occupation site. Since the private collection that included these projectile points was destroyed in a fire, further test excavations at this site would be necessary to establish the presence of a Paleo-Indian period component.

Present Condition of Site: This site, on a high terrrace overlooking Bear Creek, has been minimally impacted by ranching activities in historic times. Subsurface cultural deposits appear to be intact and extend to a depth of at least 65 cm below surface.

National Register Statement: The Johnson Family site (24PA159) meets criteria D of the National Register of Historic Places. It has the potential to yield further significant information dealing with hunting-subsistence strategies and lithic technology. The site appears to have a high potential for yielding datable materials. The Johnson Family site is recommended as eligible for the National Register of Historic Places.

Management Recommendations: It appears at this time, that the Johnson Family site is located just south of the Homestake Mining Company environmental study area. It does not appear at this time that this site will be impacted in any way by mining activity proposed by the Homestake Mining Company. In the future, if this area should become part of a mine impact area then further work will be necessary including a determination of eligibility, the development of a mitigation plan and extensive test excavation. No further work is recommended at this time. The site has been mapped, collected, recorded, testing and photographed.

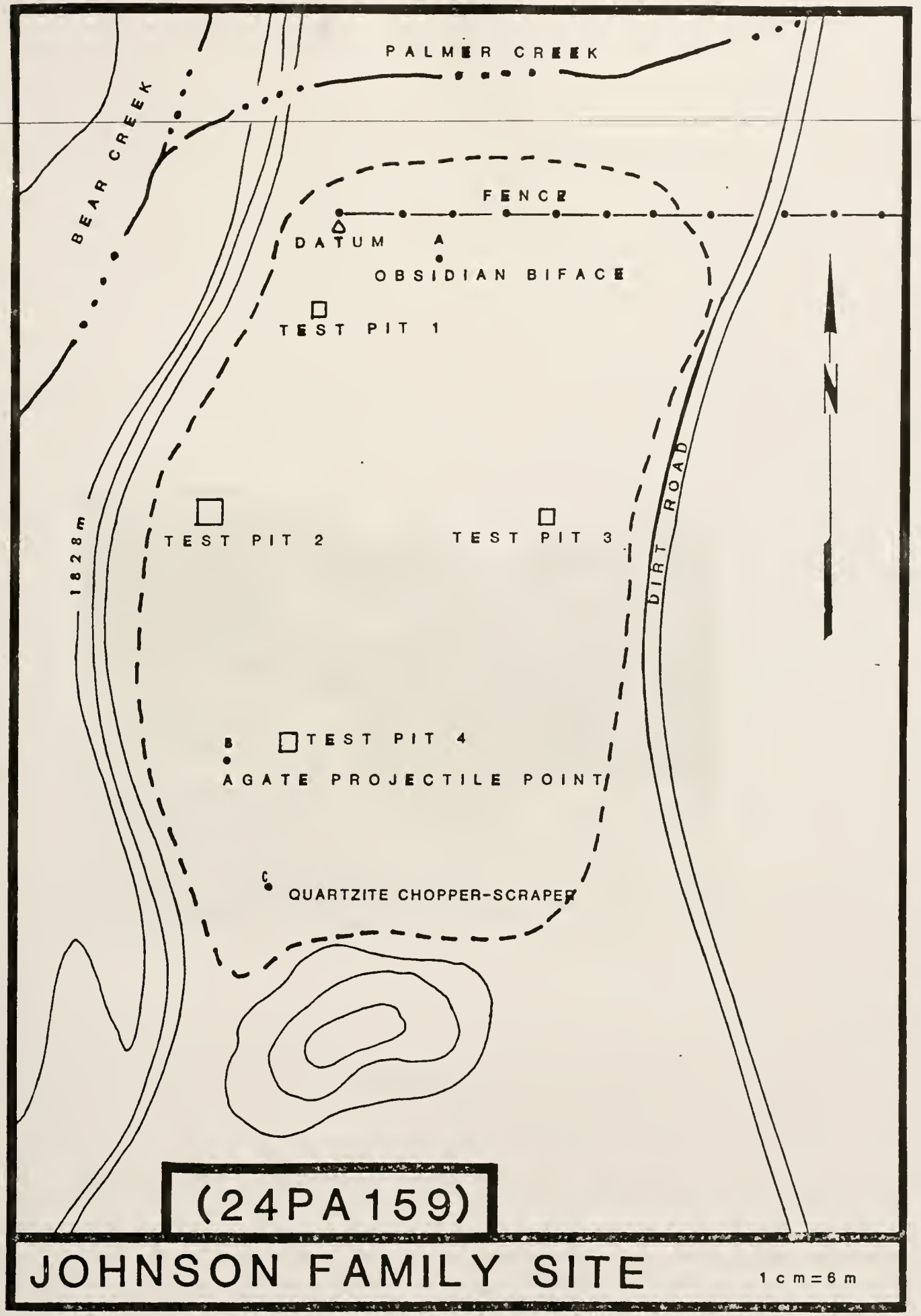

Figure 25. Site sketch map. Johnson Family site (24PA159)

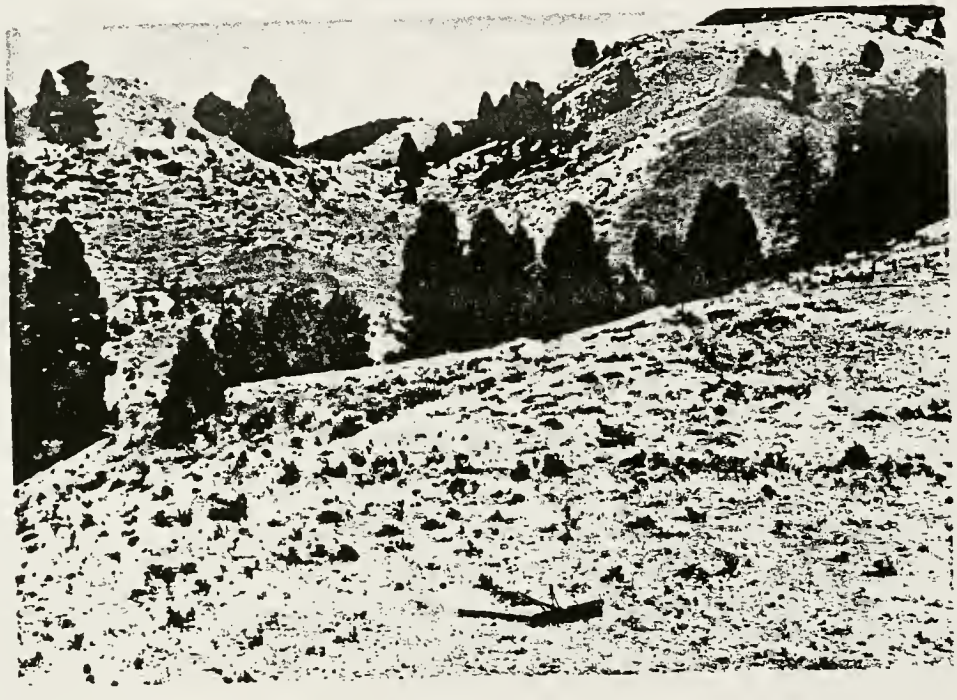

Figure 26. Johnson Family site (24PA159). Northwest view.

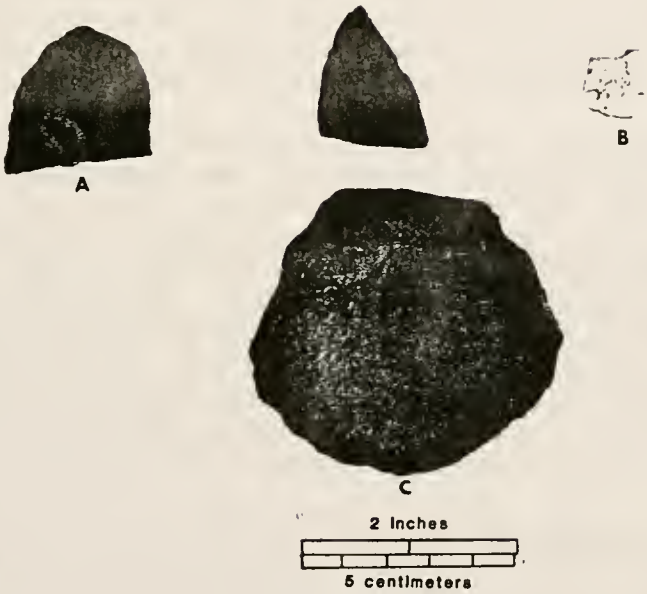

Figure 27. Johnson Family site - artifacts.
a) obsidian biface fragment
b) agate corner-notched projectile point
c) quartzite chopper-scraper.

Sargon's Site 24PA340

Location: SW1/4 SE1/4 NW1/4 section 17, T9S R9E Area: 1320 m^2

Elevation: 6400 ft. (1950 m)

Description: Sargon's site is a lithic scatter. It is situated on a high flat terrace that trends southwest to northeast (Figures 28-29). The site area overlooks the Palmer Creek drainage and the Johnson Family site (24PA159) to the south and the Bear Creek drainage to the west. The terrace consists of alluvial deposits and glacial till deposits. The western edge of the site area drops sharply to the Bear Creek drainage on the west and the Palmer Creek drainage on the south. This site is located on National Forest lands administered by the Gallatin National Forest (Gardiner District). This terrace has not been disturbed by agricultural activity. The site is in a terrace-rangeland vegetation zone and on-site vegetation consists of range grasses (needle and thread, grama), sagebrush and a few isolated junipers. Soils on the site are fairly well-developed and consist of dark brown alluvial soils and well sorted glacial till deposits. Palmer Creek, located several hundred meters south provides a water source.

Cultural Materials: Cultural items observed on the site locale include a obsidian biface fragment (Figure 30), two unmodified chunks of chert, four unmodified chunks of agate and 40 small flakes of obsidian, chert and agate that were derived from the pressure retouch flaking. Five test pits (1 m^2) were excavated to a depth of 50 cm below surface. Test pit #1 yielded four obsidian pressure flakes from 0-30 cm below surface. Test pit #2 yielded two obsidian pressure flakes from 20 cm below surface. Test pit #3 yielded two obsidian pressure flakes and one chert pressure flaked from 10-30 cm below surface. Test pit #4 yielded two obsidian and two chert pressure flakes from 10-20 cm b.s. Test pit #5 was sterile to a depth of 50 cm below surface. No charcoal was detected in any of the test pits.

Cultural Activities Represented: This site may have been a hunting lookout for a small hunting group watching for game in the Bear Creek and Palmer Creek drainage or on the rangeland of Deckard Flats. The presence of small pressure flakes would suggest the reworking or reshaping of completed stone tools.

Chronological Placement: Unknown.

Present Condition of Site: This site is on a high terrace overlooking the Bear Creek and Palmer Creek drainages. No roads cross the site and there has been no ranching activity on the terrace. The site locale is undisturbed and soil depostion is stable.

National Register Statement: Sargon's site (24PA340) is not eligible for the National Register of Historic Places. The site has no potential to yield any further information significant in local or regional prehistory. The light lithic scatter, the small number of flakes located subsurface (identical to those on surface), the lack of technologically or chronologically diagnostic artifacts, and the lack of datable material all attest to the low potential

for yielding further information. Sargon's site is recommended as not eligible for the National Register of Historic Places.

Management Recommendations: This site is not eligible for the National Register. The site locale will not be impacted by any mining activity. No further work is recommended. The site has been mapped, recorded, tested, collected and photographed.

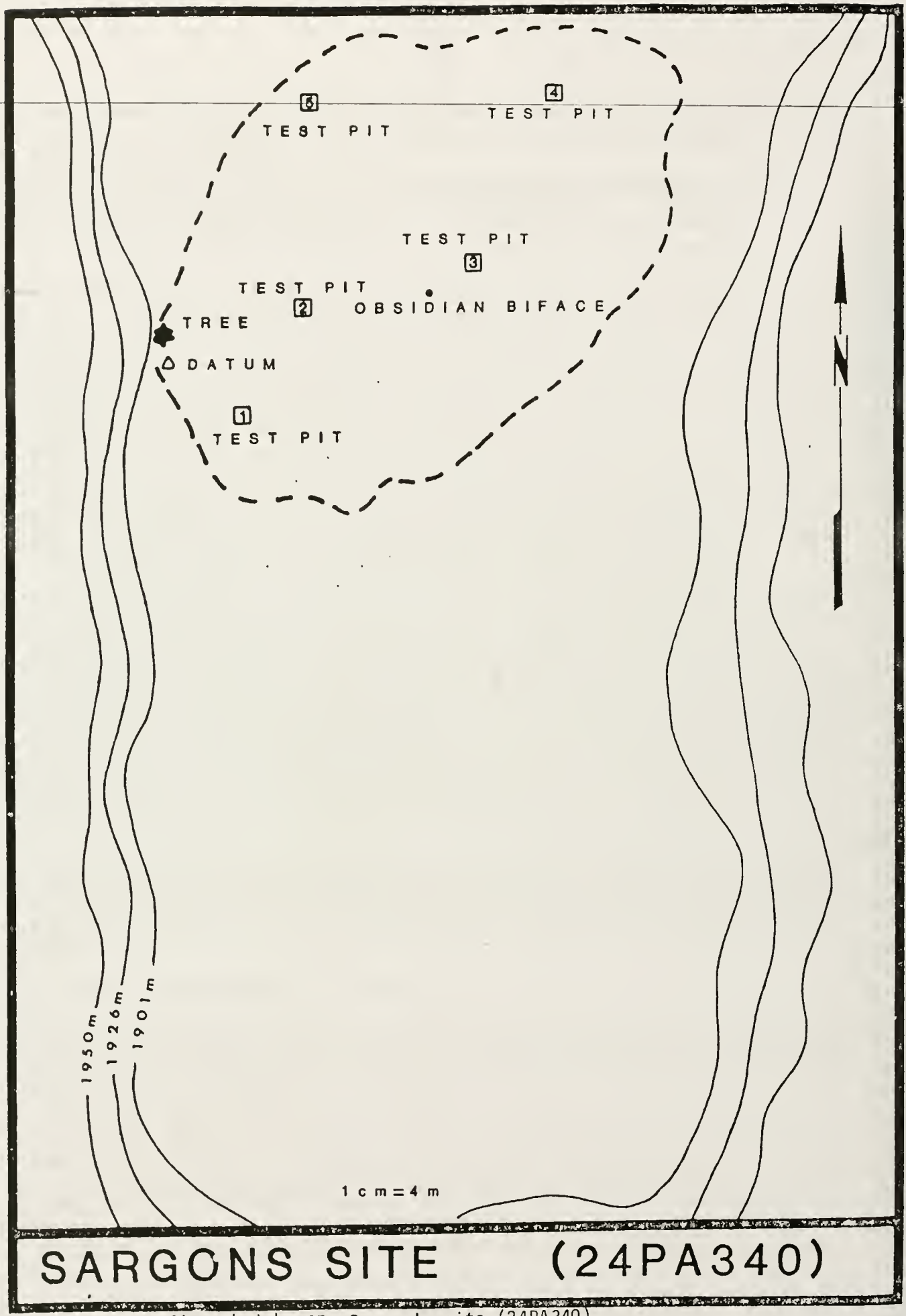

Figure 28. Site sketch map, Sargon's site (24PA340).

Figure 29. Sargon's site (24PA340), southern view.

Figure 30. Sargon's site (24PA340)- artifacts.
b) obsidian biface fragment

PART VII

HISTORIC SITE NARRATIVES

Hanlon Hill Adits Site 24PA342

Location: NW1/4 SW1/4 SE1/4 section 5, T9S R9E Area: 5486 ft.^{2} (18,000 m^2)

Elevation: 7000 - 7250 ft. (2133-2209 m)

Description: This is an historic mining site located on the west side of Hanlon Hill approximately 1/2 mile northwest of the town of Jardine. The site is located on a steep hillside stretching to the western edges and on top of Hanlon Hill. Vegetation in the area consists of sagebrush and range grasses. Pole Creek, a perennial stream flows west of the site area. Soils are skeletal and eroding.

Structures, Features and Cultural Materials: This site consists of twenty-two features related to historic mining activity (Figure 31) that includes thirteen adits (all caved), two trenches, two collapsed shafts, and five circular prospect holes. Feature 1 is a collapsed adit and waste development dump. Features 2, 3, 4, 5 and 6 are all shallow collapsed adits. They are all similar in appearance and are shown in Figure 32. Feature 7 (Figure 33) is a collapsed adit with a waste development dump. Some ore-car tracks were located at this feature which appears from the size of the dump to have been the largest of the mining features at this site. Feature 8 is a collapsed adit and waste development dump. Features 9, 10 and 11 are collapsed shallow adits. Features 12, 13, 15, 17 and 21 are circular prospect holes measuring approximately 12 ft. in diameter and 6-8 ft. in depth. There are no structures associated with them. Feature 14 and 16 are collapsed adits. Figure 34 shows the waste development dump from adit #14. Features 18 (Figure 35) and 19 are collapsed timbered shafts. Both are completely caved in. Round logs were used in the timbered with commercial wire-cut round nails driven in to hold the logs together. Features 20 and 22 are shallow trenches dug by hand that measure approximately 30-50' in length and 3-5' in width. All of the features at this site are in poor condition. No structures are associated with them.

Evaluation: It is not known when this site was used for mining activity. All the characteristics of the mine adits and prospect holes at this site suggest that this was an exploratory prospecting endeaver attempting to locate mineralized deposits west of the Bear Creek fault. Due to the deteriorated condition of the features at this site, little can be said of structural elements such as timbering in the shafts. All of the adits appear to have been shallow and untimbered. Rock on the dumps is mostly rhyolite and some scheelite (tungston ore). No mining claims were ever filed on this part of Hanlon Hill.

The GLO Plat of 1916 shows a house belonging to Barney Hanlon located in the SW1/4 SE1/4 section 5, T9S R9E. This structure no longer exists. A letter written by Dr. James Stuart of Livingston, former assayer for Harry

Bush and the Bear Gulch Mining Company (1899-1901) in 1915 to A.C. Jardine mentioned that Barney Hanlon, John Howell and John Lewis worked claims on Pole Creek.[246] This site is undoubtedly the result of these men's mining activity although no claims were ever filed. It is known from newspaper accounts that Barney Hanlon was arrested on June 13, 1907 for shooting Thomas Lennon, a miner working for the Kimberly-Montana Company and was sentenced to life imprisonment.[247] This information would suggest that some of the workings at this site may date prior to 1907.

National Register Statement: The Hanlon Hill Adits site is not eligible for the National Register of Historic Places. Due to the deteriorated condition of the mine workings little can be said concerning structure or mining technology. No further information can be obtained from this site. It is not recommended for nomination to the National Register of Historic Places.

Recommendations: This site is located in an area that may be impacted by construction activity associated with the mining project. It is doubtful that this site will be impacted due to its location on the steep west side of Hanlon Hill. The site has been mapped, photographed and recorded. Historical records have been researched. No further work is necessary.

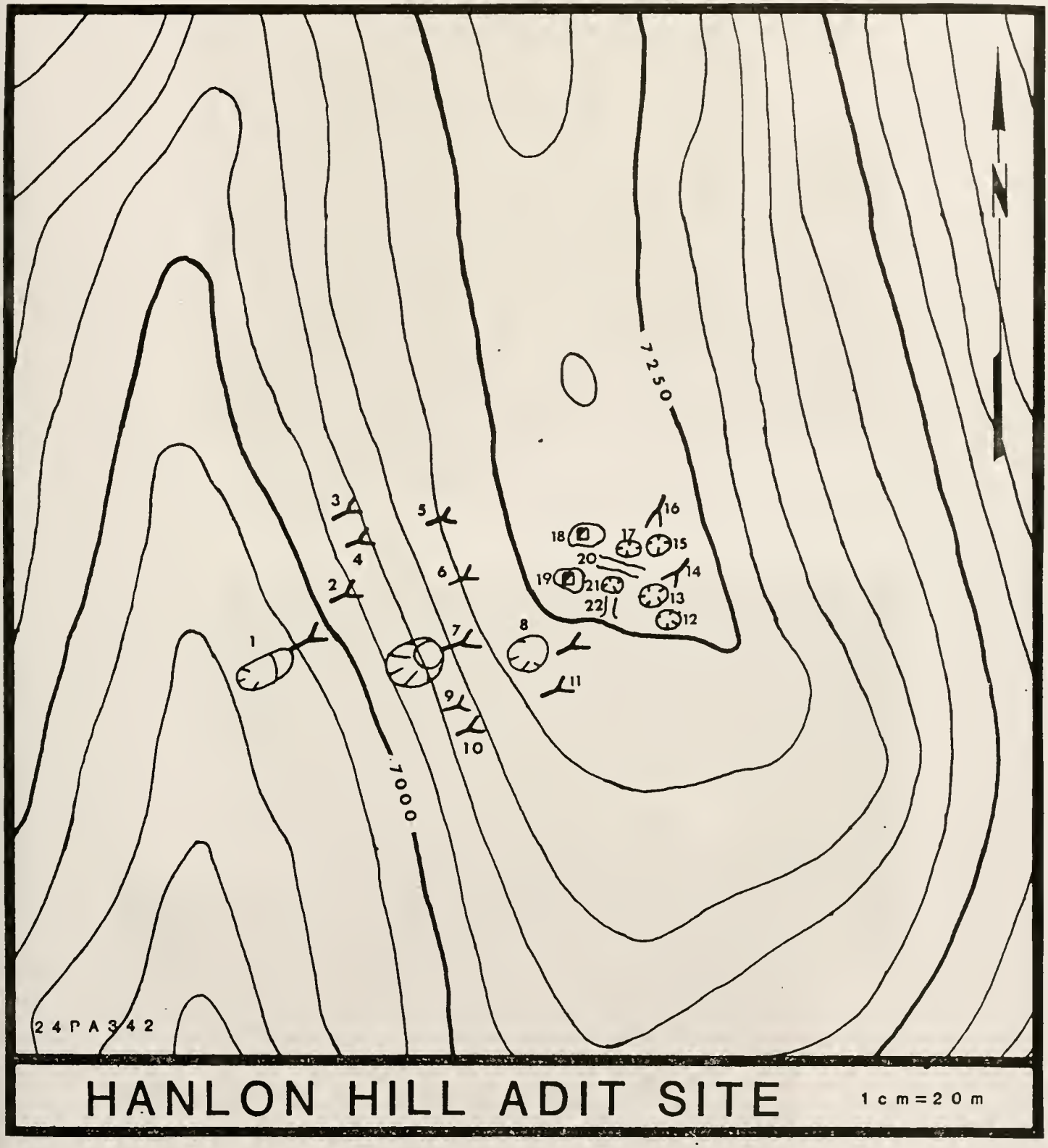

Figure 31. Site sketch map, Hanlon Hill Adits site (24PA342).

Figure 32. Feature #2, Adit, Hanlon Hill Adits site (24PA342).

Figure 33. Feature #7, Adit and waste development dump, Hanlon Hill Adits site (24PA342).

Figure 34. Feature 14, waste development dump, Hanlon Hills Adits site (24PA342).

Figure 35. Feature 18, collapsed timbered shaft, Hanlon Hill Adits site (24PA342).

Jardine 24PA339

Location: S1/2 section 4, N1/2 section 9, SE1/4 NE1/4 section 8, T9S R9E

Site Area: 320 Acres (approx)

Elevation: 6400' - 7200' (1950-2194 m)

Description: The site of Jardine (24PA339) as described in this narrative includes all of the townsite of Jardine located along Bear Gulch in sections 8, 9 and 4, the historic mining sites on the west side of Mineral Hill, the Jardine cemetery, and two previously recorded historic sites; the Pine Creek Cabins (24PA410) and the Mineral Hill Cabins (24PA185). Vegetation in the area consists of range grasses, riparian plants, alder, lodgepole pine, Douglas fir and introduced plants. The geology and soils of this site have been discussed in the environmental section of this report. Figures 36-38 include a site sketch map.

Structures, Features and Cultural Materials: The site of Jardine consists of 165 structures and features associated with the town of Jardine and mining areas on the west side of Mineral Hill. Figures 39-41 show some of the structures in 1981, Figure 42 shows Jardine in 1925 and Figure 43 shows Jardine in the early 1940s. All structure numbers on the photographs correspond to those on the site sketch map.

Structures and Features on West Side of Bear Creek: Figures 44 and 45 provide views of the west side of Bear Creek.

Structure #1 (Figure 46) is a 15' x 15' cabin of the typical Jardine style of log construction . It has a front porch with an overhanging roof and sits on a concrete foundation. The building appears to have been moved to the site. This building is a private residence. The cabin is in excellent condition and was built in the 1930s. The typical Jardine log construction style seen in many of the log homes in Jardine is a style that differs from standard techniques of log joinery which utilize various forms of notching. This Jardine technique utilizes a two inch wide plank nailed to the ends of the logs at each corner. The corner is then finished with vertical one inch boards (see Architectural Plate #2, Figure 190).

Structures #2, #3, #7 (Figures 47-48) are small wood shacks all measuring 10' x 20'. They are wood frame with lapped siding and a gable roof. The roofing is wood shingles doubled up every fourth course to create a series of horizontal bands across each slope of the roof. These shacks are currently used for storage related to a small stock operation. Two more of these shacks are found joined in a "T" configuration near the intersection where the Jardine road leaves Gardiner. These small shacks may have had an original use related to the town of Jardine. They may have been small miners quarters that Harry Bush planned to construct in Jardine. These structures are all in good condition.

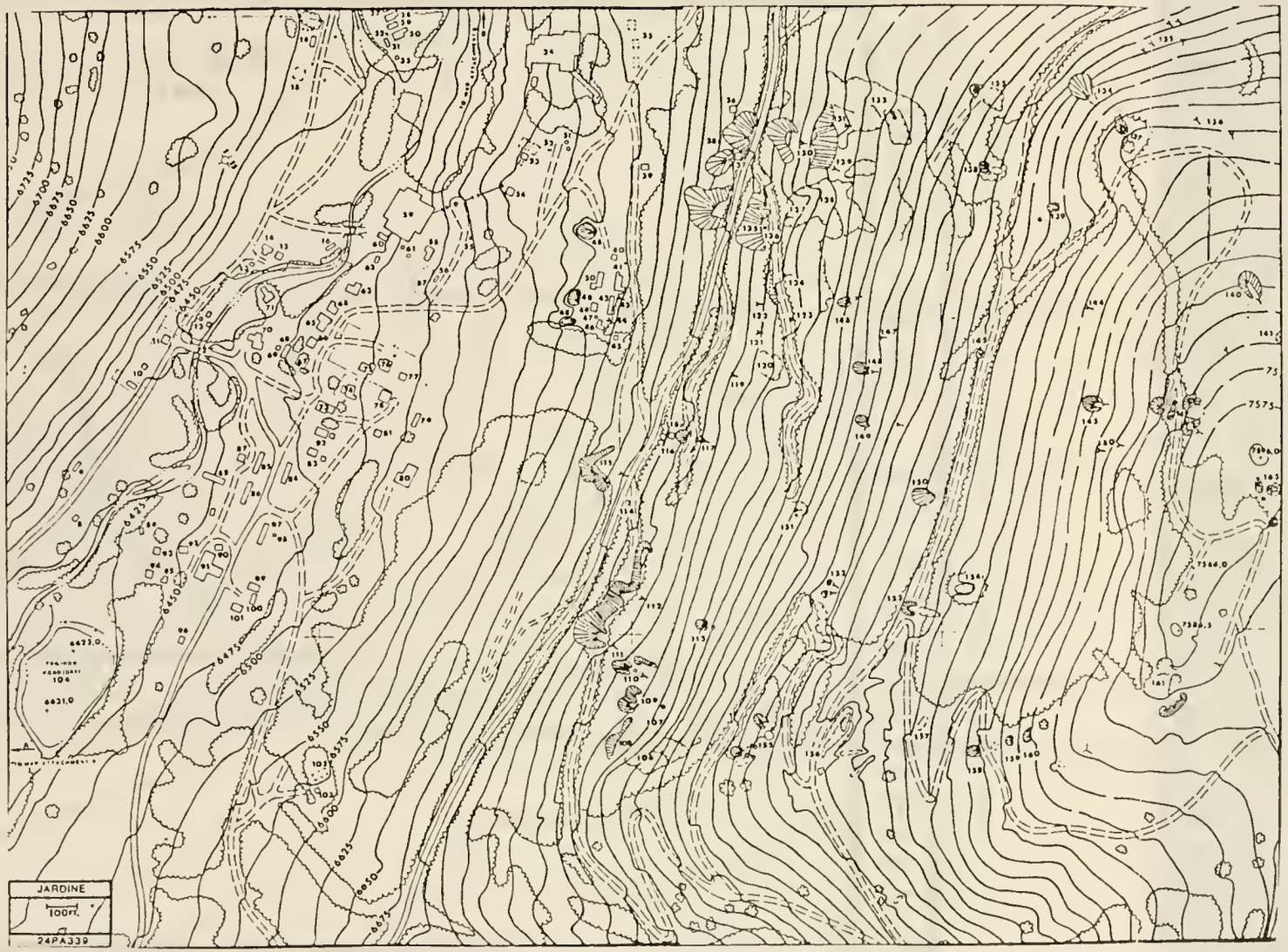

Figure 36. Site sketch map, Jardine (24PA339).

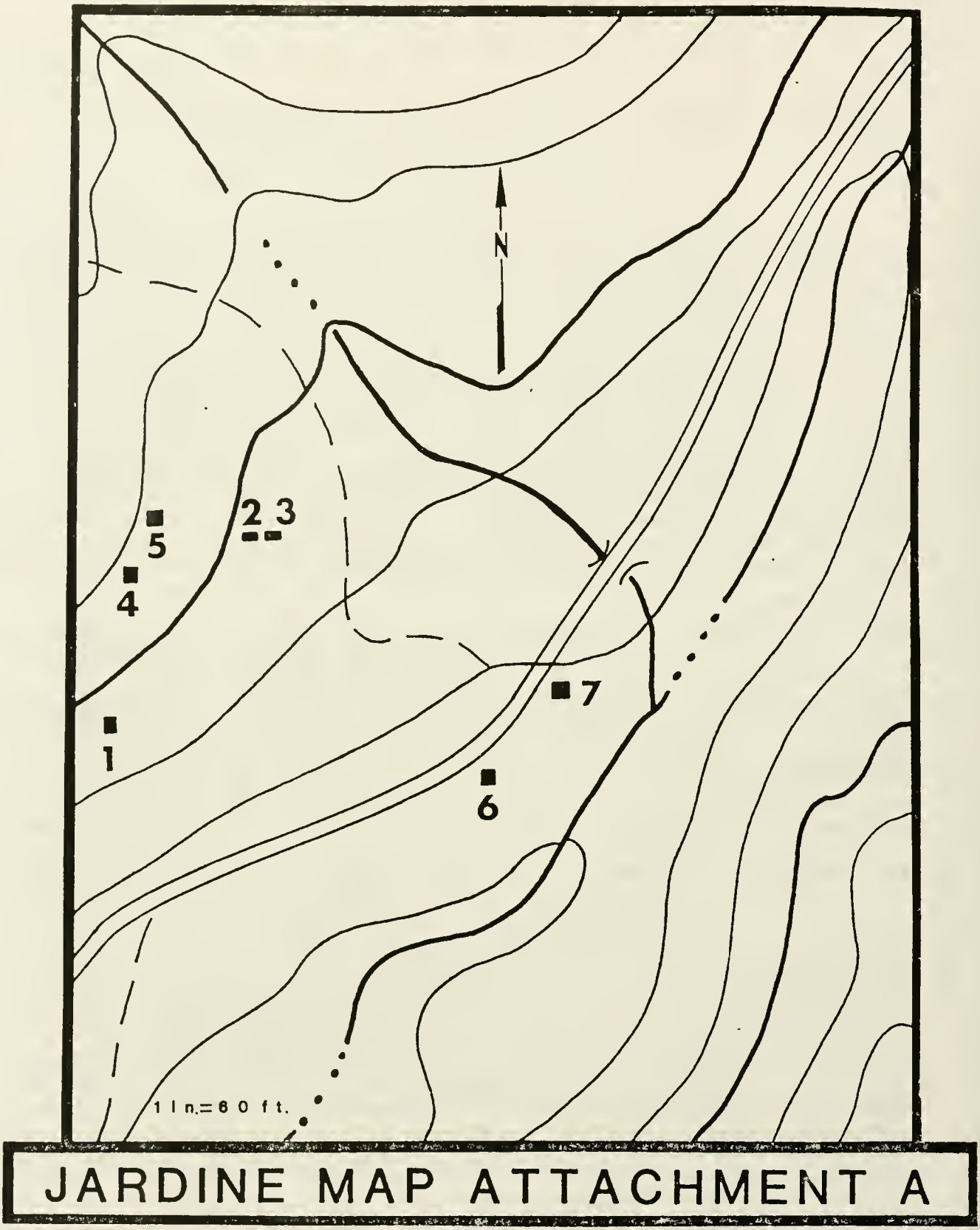

Figure 37. Site sketch map, Jardine (24PA339), Attachment A.

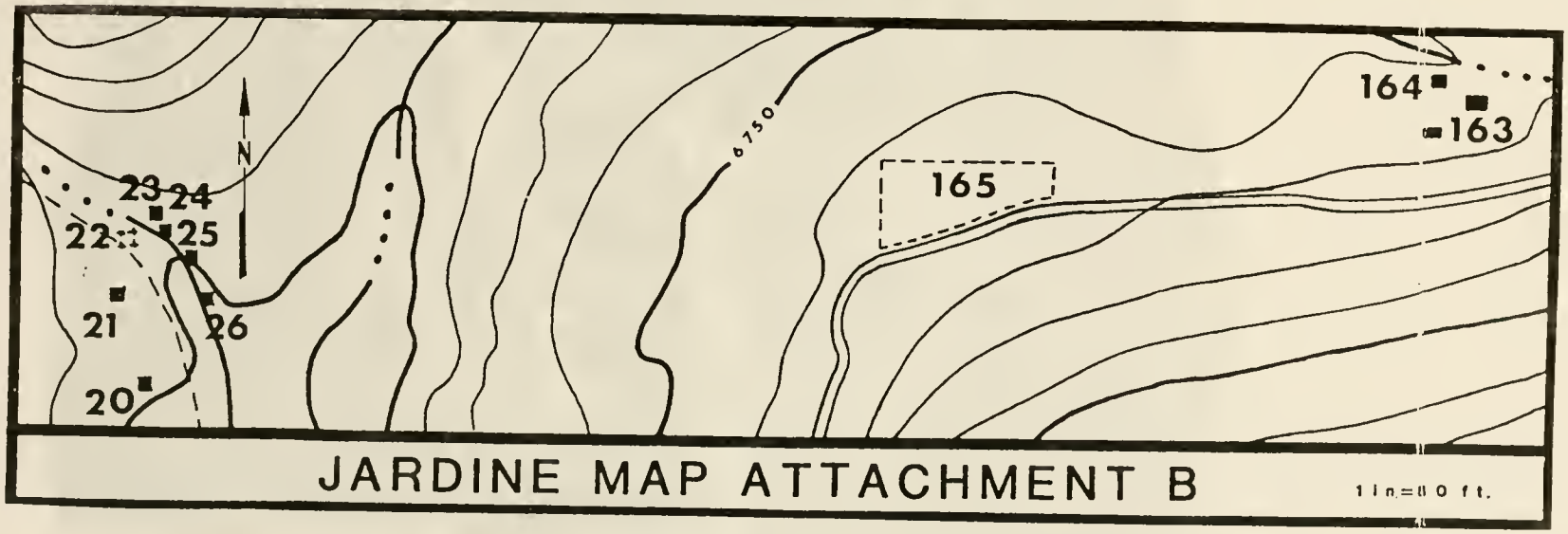

Figure 38. Site sketch map, Jardine (24PA339), Attachment B.

Figure 39. Jardine (24PA339). Northeast view from Hanlon Hill.
A. Revenue mill
B. Arsenic plant

Figure 40. Jardine (24PA339). East view from Hanlon Hill.
A. Revenue mill (structure #34)
B. Arsenic mill (structure #59)
C. Mine company office (structure #73)
D. School (structure #79)
E. Structure #82
F. Structure #83
G. Transformer house (#54)
H. Structures #40-50
I. Assay office (#58)
J. Structure #63
K. Structure #65
L. Structure #16

Figure 41. Jardine (24PA339). Northeast view from Hanlon Hill.
A. Revenue mill
B. Transformer house (#54)
C. Structures #40-50
D. Arsenic Mill
E. Assay office (#58)
F. Structure #63
G. Structure #16
H. Structure #61 (cyanide vats)
From old cyanide mill.

Figure 42. Jardine, Montana (ca. 1925). (Photograph courtesy of Bill and Doris Whithorn, Park County Museum, Livingston, Montana.)

Legend - Figure 42

(1925 photograph of Jardine)

A. Revenue mill (structure #34)

B. Arsenic mill (structure #59)

C. Cyanide mill (burned - 1948)

D. Bush guesthouse (structure #67)

E. Mine company office (structure #73)

F. Bear Gulch Hotel (burned - 1942)

G. Structure #90

H. Schoolhouse (structure #79)

I. Transformer house (structure #54)

J. Revenue tramway (remnant remains)

K. Water tower house (structure #36)

L. Ore storage house (structure #37)

M. Compressor house (structure #41)

N. Blacksmith's shop (structure #42)

O. Tramway (torn down)

P. Structure #63

Q. Structure #64

Figure 43. Jardine, Montana (ca. 1940s). Photograph courtesy of Bill and Doris Whithorn, Park County Museum, Livingston, Montana.

A. Revenue mill (structure #34)
B. Arsenic mill (structure #59)
C. Cyanide mill (burned - 1948)
D. Transformer house (structure #54)
E. Ore storage house (structure #37)
F. Dry house (structure #50)
G. Compressor house (structure #41)

Figure 44. West side of Bear Creek, northview.
Structure complex #12.

Figure 45. West side of Bear Creek, southview.
Structure complex #12.

Figure 46. Structure #1.

Figure 47. Structures #2 and #3.

Figure 48. Structure #7.

Structure #4 (Figure 49) is rectangular shaped log cabin with a porch and overhang roof. The cabin has a door entrance on the north side and small windows on the east and west sides. The cabin measures 15' x 32' x 6' and sits on square sill logs. The roof consists of wood planks laid over the center log. The roof at one time had corrugated tin roofing material nailed to the wood planks. All of the nails used in the cabin were commercial wire-cut round nails. Mr. Athas, owner of the cabin felt it was built around 1910. The logs exhibit saddle-notching throughout the structure. The cabin is in good condition.

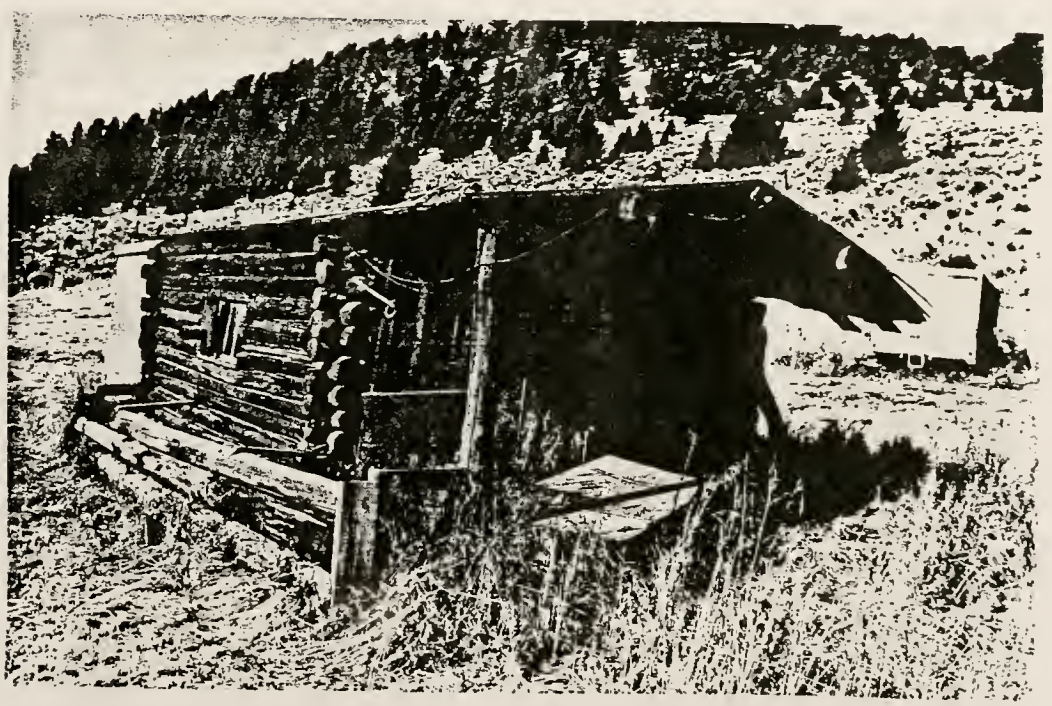

Figure 49. Structure #4.

Structure #5 (Figures 50-51) is a rectangular shaped log cabin located 60' northwest of structure #4. The cabin has a double door entrance on the east side in addition to two small windows. There are single windows on the north and south side and two windows on the west side. The cabin has a gable roof with a small crawl space in the eaves. All of the logs are saddle-notched. The roof consists of wood planks laid from the center ridge pole. The cabin sits on square sill logs and was built using commercial wire-cut round nails. This cabin was built around 1910. The cabin is in good condition.

Structure #6 (Figure 52) is a log barn measuring 18' x 25' x 9. It is built of round logs that are saddle-notched at the corners. The barn has entrances on the east and west sides. The barn has a gable roof with wood plank roofing covered with corrugated tin strips that are overlapped. There is a wood-frame shed attached to the northeast side. The barn is in good condition and was built ca. 1920. The gable space is covered with vertical wooden boards. Commercial wire-cut round nails are used throughout the barn. The barn is in good condition and is privately owned.

Structure #8 is a modern log house.

Structures #9, #10 and #11 (Figures 53-54) consist of a collection of shacks, houses and automobile bodies. The buildings are completely constructed of parts of other buildings that had been torn down in the Jardine area in recent years. These structures are privately owned and in poor condition. The construction materials include logs, wood board, cement blocks and travertine slabs.

Structure complex #12 (Figures 55-58) consists of a log house with a wood shed attached to the north end and three small wood frame sheds with a vegetable garden. The log house measures 32' x 14' x 6.5' and has a gable roof covered with modern wood shinges. This building is privately owned and was probably constructed in the 1930s. The woodframe sheds are small, used for storage and were built recently. One shed appears to have been constructed from pieces of other buildings. The log buildings exhibits typical Jardine log construction style.

Structure #13 (Figure 59) is a small wood frame garage with a door on the south side. This structure is modern having been built in the last 20 years or so.

Structure #14 (Figures 60-61) is a log cabin with a gable roof that exhibits the typical Jardine log construction technique that utilized the plank joinery rather than notching. The main body of the house is about 16' x 40' x 7' and the southern wing is 16' x 20' x 7'. Each is covered by a gable roof and sits on a concrete foundation. The building has a tin roof. Structure #15 (Figure 61) is a 12' x 12' x 6' log shed with no foundation. The logs are saddle-notched at the corners and round wire-cut nails are used throughout the structure. Both structures are in good condition.

Structure #16 (Figure 62) is a log and wood frame barn moved to this site several years earlier. The barn appears to be pieced together from several other buildings. It is in fair condition.

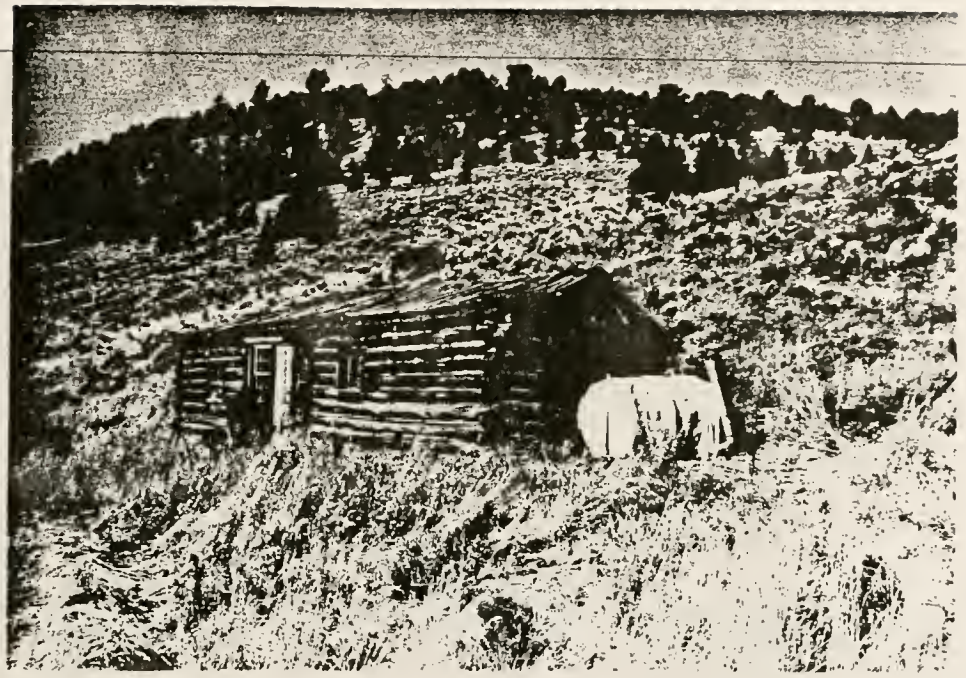

Figure 50. Structure #5, west view.

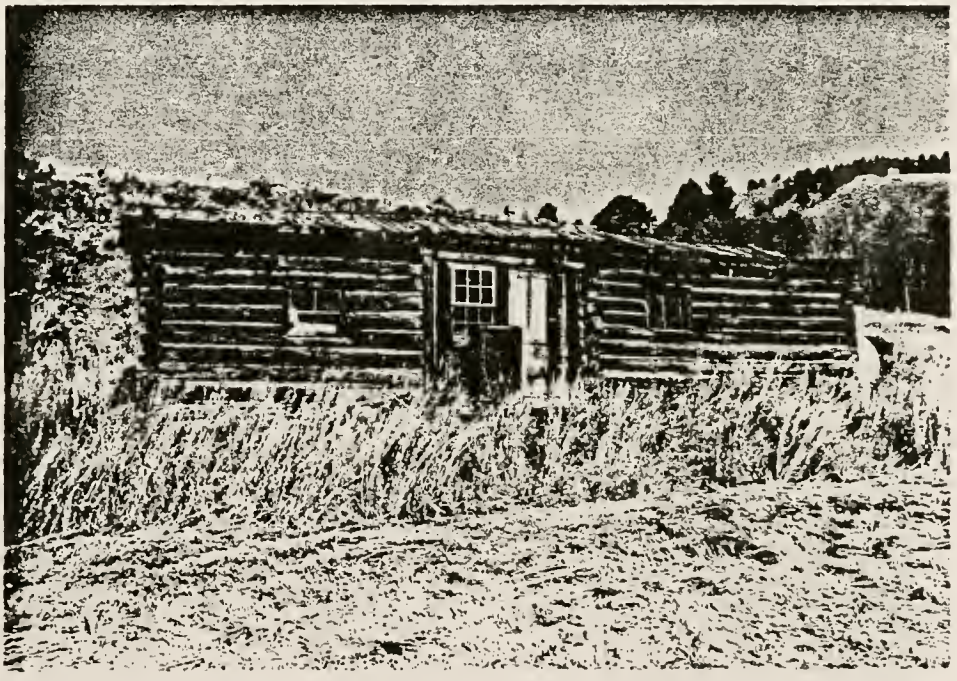

Figure 51. Structure #5, southwest view.

Figure 52. Structure #6, east view.

Figure 53. Structures #9 and #10.

Figure 54. Structure #11.

Figure 55. Structure Complex #12, north view.

Figure 56. Structure complex #12, log house, south end.

Figure 57. Structure complex #12, log house, south end.

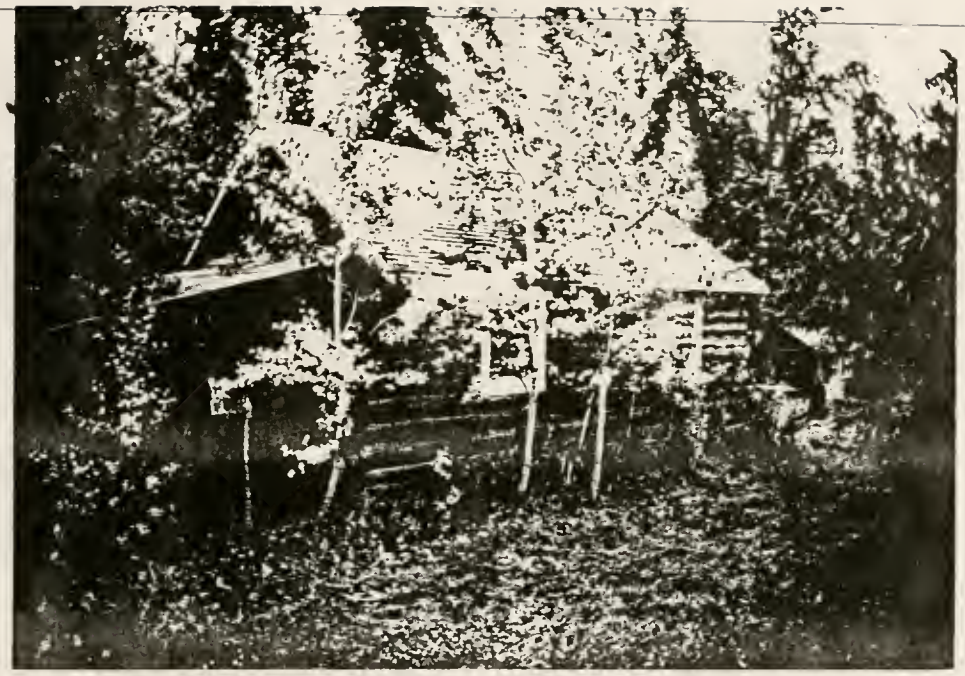

Figure 58. Structure complex #12, log house with shed attachment, west view.

Figure 59. Structure #13, east view.

Figure 60. Structure #14, west view.

Figure 61. Structure #14, east view and structure #15.

Figure 62. Structure #16 (left of center), east view.

Structure #17 (Figure 63) is a makeshift square log stringer bridge which crosses to the arsenic mill. The bridge is in poor condition.

Structure #18 (Figure 64) is a reinforced concrete foundation ruin measuring 12' x 20' x 4'. There are concrete buttresses against the west wall. The building that stood on this foundation apparently burned. There are charred pieces of nailing strips left in horizontal grooves in the interior walls. There are also three concrete pads (1'x1') on the east side, 6' from the wall. The type of building that stood here is unknown.

Structure #19 (Figure 65) is a log cabin measuring 12' x 20' x 8 that again shows the typical Jardine log construction type with plank corner joinery rather than notched logs. The cabin sits on a stone foundation and has a wood shingle gable roof. This building was probably constructed in the 1930s. Three small wood frame sheds are located south and east of this structure and are shown in Figure 66.

Structure #20 (Figure 67) is a log cabin measuring 20' x 30' x 10' built on a stone foundation. The cabin was erected using the typical Jardine style of log construction with plank joinery. The house has a gable roof with a 2' wide flat section on top in lieu of a ridge. The cabin has a enclosed porch entrance-way on the south side and a wood-frame shed 20' to the west. The cabin also has a brick chimney. It was probably built in the 1930s. The cabin is privately owned and in good condition.

Structure #21 (Figure 68) is a 15' x 25' x 7' round log cabin with saddle-notched joints at the corner. It has a corrugated sheet metal gable roof and a porch running along the east side. There is a small wood-frame outhouse located 30' southwest of the cabin. There is a small house-trailer placed to the north of the cabin. The house is privately owned and in good condition.

Structure #22 is the badly deteriorated remains of a non-reinforced concrete foundation. There is no information as to what type of house stood on this foundation. It is in poor condition.

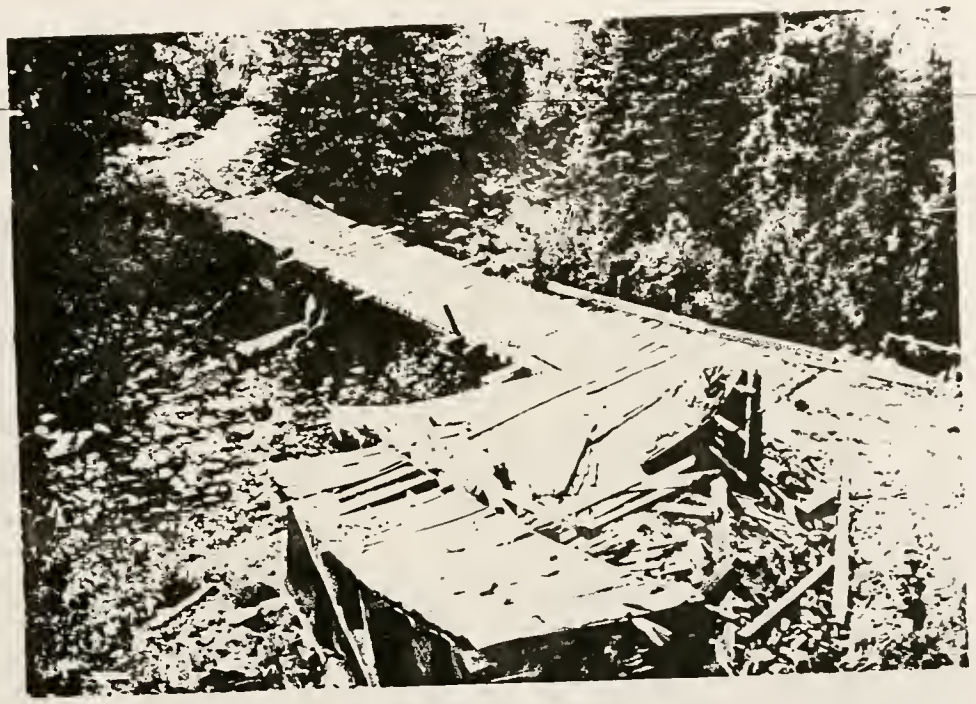

Figure 63. Structure #17, west view.

Figure 64. Structure #18, west view.

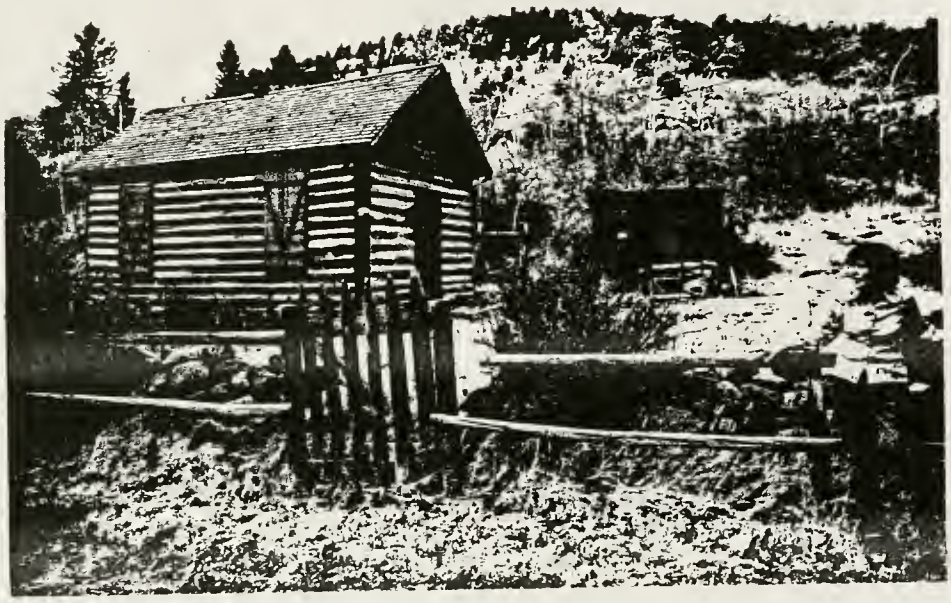

Figure 65. Structure #19, west view.

Figure 66. Wood-frame sheds, south of structure #19.

Figure 67. Structure #20, west view.

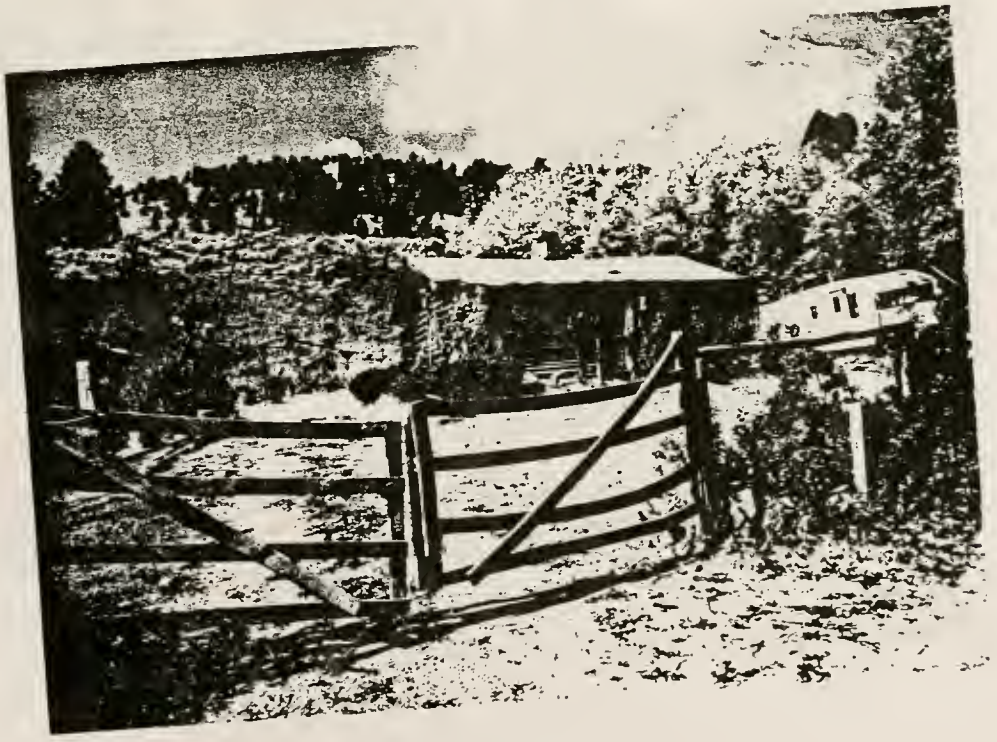

Figure 68. Structure #21, west view.

Structures on the east side of North Fork of Bear Creek and west of main Bear Creek drainages.

Structure #23 is the collapsed ruins of a wood-frame shed (Figure 69).

Structure #24 is a log cabin with three rooms and a front porch (Figure 70). The corner joints are all square-notched and the cabin has a gable roof with wood plank roofing material.

Structure #25 is a collapsing log barn with a wood-plank roof that is slightly peaked (Figure 71). The corner joints are all saddle-notched.

Structure #26 is a wood-frame storage shed (Figure 72).

Figure 69. A) Structure #23
B) Structure #24
C) Structure #25
(north view)

Figure 70. Structure #23 (on right)
Structure #24 (on left)
(North view)

Figure 71. Structure #25, west view.

Approximately 100 yards south of structures #23 - #26 is a second cluster of structures (#27-#33) that are shown in Figures 73-80.

Structure #27 is a rectangular shaped wood frame shack measuring 8' x 11' x 6.5' with a slightly peaked roof. It is in poor condition and appears to have been used as a storage shed.

Structure #28 is a log cabin measuring 7.5' x 14' x 5.5' that was built utilizing saddle-notching at the corners. The cabin has a small wood-frame vestibule on the east side. The structure has a wood plank roof and is in poor condition.

Structure #29 is a dilapidated multiple room wood-frame shack-garage measuring 11' x 17' x 6' in poor condition and leaning slightly to the south.

Structure #30 is a tar paper covered wood-frame shack measuring 8' x 19' x 6' with a flat roof and a small porch on the south side.

Structure #31 is a small log and wood-frame cabin measuring 7' x 11' x 6' in poor condition with a tar paper roof.

Structure #32 is a small wood-frame outhouse located north of structure #31.

Structure #33 is a collapsed square wood-frame shack located south of the other structures in this complex.

This cluster of buildings is arranged in an organized fashion from north to south and may have been used by placer miners. The structures were probably built in the 1920s. Historical debris in the area of the structures include a 1940's Dodge pick-up truck, nails, tin cans (1930s) paint cans, metal tubs, automobile parts, oil cans, shovels and assorted pieces of scrap metal. This group of buildings is located on the Joe Dandy Placer claim (MSN 5583) that was once part of Harry Bush's holdings.

Figure 72. Structure # 26, north view.

Figure 73. A. Structure #27
B. Structure #28
C. Structure #29
(west view)

Figure 74. A. Structure #29
B. Structure #28
C. Structure #27
(east view)

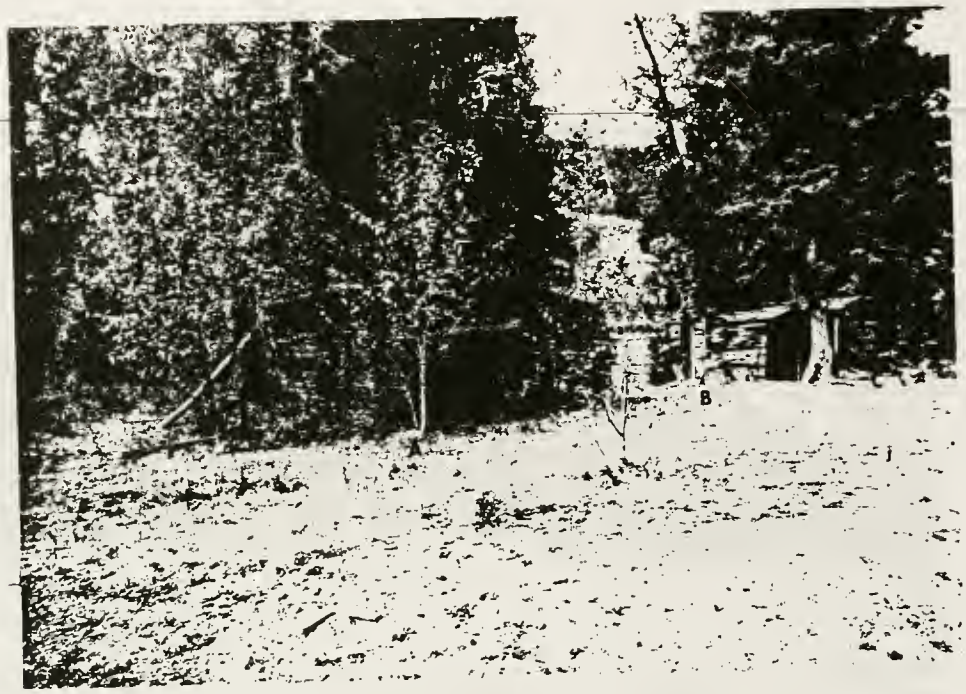

Figure 75. A. Structure #29
B. Structure #28
C. Structure #27
(northwest view)

Figure 76. A. Structure #31
B. Structure #30
C. Structure #29
D. Structure #28
E. Structure #27
(west view)

Figure 77. Structure #28, west view.

Figure 78. A. Structure #31
B. Structure #30
(north view)

Figure 79. A. Structure #31
B. Structure #32
(north view)

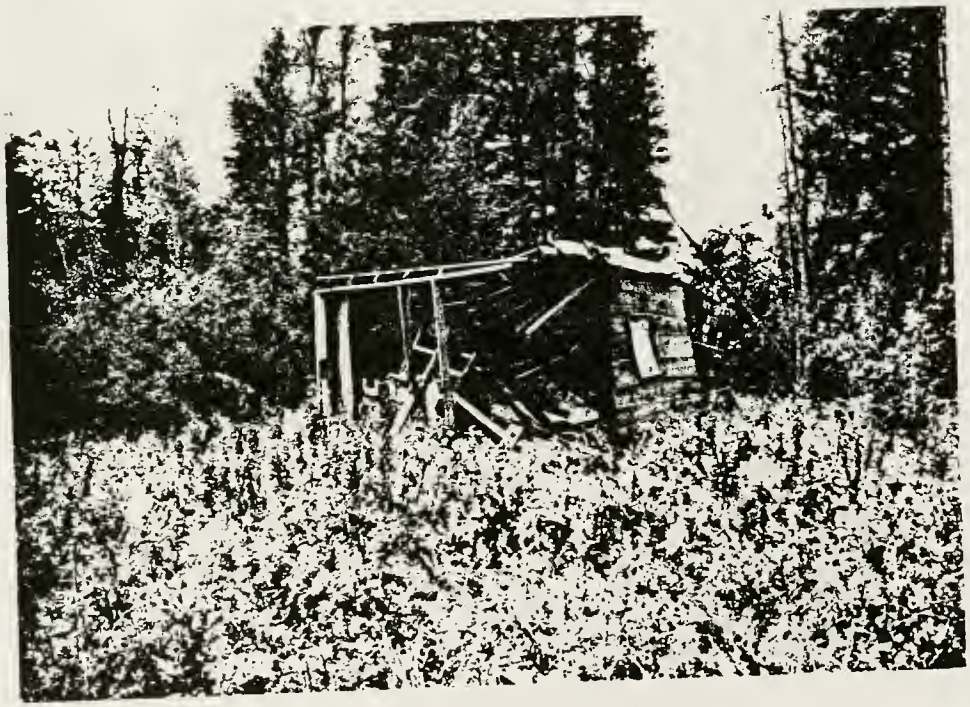

Figure 80. Structure #33, west view.

Crossing the main Bear Creek drainage to the east one encounters structure #34, the Revenue or "Red" Mill.

Structure #34 is the Revenue Mill built by Harry Bush's Revenue Mining Company in 1899. It is typical of stamp mills built throughout the western mining frontier and is one of the most intact extant examples in the region. Figures 80 and 81 show the Revenue Mill under construction in 1899. Figure 15, earlier in the report, shows the Revenue Mill shortly after completion in 1899. It is located on the Revenue Lode and Mill Site (MSN 55738) a claim filed by George Phelps in 1898.

To remove gold from ores, they must be crushed to sand to reveal the metallic gold. The Egyptians crushed ore with slave labor.[248] In the place of slave labor, subsequent civilizations developed machines to crush large quantities of ore. One crude machine, used by the Spaniards in the New World, was the arrastra, a flat stone pulled over a stone platform by animal power to crush the ore. But, given the capital and the transporation, a more effective machine was available: the stamp mill. Stamp mills go back at least to the 14th or 15th centuries in Germany where they were used to crush gunpowder. The 16th century German, Agricola, described and illustrated stamp mills being used in Cornwall essentially the same as the more modern machines found in the American West.[249] A similar stamp mill was used in 16th century Potosi in South America. The first stamp mill known to have built in the U.S. was in Virginia in 1835.[250] With the discoveries of gold in California in 1849 and in Colorado in 1859, the design of stamp mills was refined, but the basic principles remained the same. As gold fields were discovered, miners often built arrastras, but as soon as capital and transporation were available, modern stamp mills were built.

The earlier stamp mills crushed the ore so that the gold could be removed by amalgamation. The crushed ore, with exposed gold particles, would be passed over mercury coated plates. The gold would bond to the mercury to form an alloy known as amalgam which was cleaned off the plates periodically. The amalgam would be retorted to yield distilled mercury, which was reapplied to the plates, and molten gold, known as a sponge. This process was limited to extracting free milling gold ores. Much gold was bound up in refractory gold ores in which the gold was either in metallic form but surrounded by films of the oxides of other base metals, or in a form chemically combined with other elements.[251] As a result, mills were removing only a small percentage of the gold content of ores; the rest was dumped with the tailings. That all changed with the introduction of cyanide processing, in which gold was dissolved in a cyanide solution, first used commerically in New Zealand in 1889 and on a mammoth scale in South Africa beginning in 1890.[252] Introduced in the U.S. in 1891, the cyanide process changed the nature of western gold mining from glamorus prospecting for rich finds to the methodical extraction of virtually every ounce of gold from low-grade ores as well as old dumps.[253] The cyanide process required finer sands, and the stamp mill became an intermediate crusher between rock breakers and finer ball mills.[254]

The first stamp mill built in Montana was a crude affair constructed of freight wagon parts at Bannack in 1862-63.[255] After that, more sophisticated mill equipment was shipped to Montana's early gold camps by steamboat on the Missouri River or overland from the railroad at Corrine, Utah, by overland freight wagons. With the arrival of railroads to Montana in 1880, transportation of mining equipment grew cheaper and easier. By the time the Revenue Mill was built, the Northern Pacific Railroad had its Livingston to Yellowstone Park branch line built as far as Cinnabar and by 1903 was complete to Gardiner some four miles from Jardine.

The Revenue Mill was not the first stamp mill built at Jardine. Histories of the camp indicate that a Major Eaton constructed a five stamp mill in about 1884 to use in conjunction with his hydraulic mining operation. His other major building project was a saw mill. In 1890, Edgerton and Jewell of Helena added another five stamps and they operated the Bear Gulch mines until the crisis of 1893. Harry Bush arrived in 1898 and started a burst of construction and mining activity. He converted Easton's saw mill to a 20 stamp mill and began construction of the larger Revenue Mill.[256] At this time, Bush incorporated three separate companies, all headquartered in Jardine: the King Solomon Quartz and Placer Company, the Revenue Mining Company, the Empire Mining Company.[257] These companies and others were all part of the complex legal and financial manipulations between Bush, bankers, and other interested parties that were to plague mining in Bear Gulch for almost two decades. As a consequence, even though it was completed by December 1899[258] the Revenue Mill had not been put into service as late as December 1902.[259] During this time, the 20 stamp mill continued processing as much as 100 tons per day from the Keats, Sowash, and Legal Tender Mines.[260]

Construction on the Revenue Mill was under the superintendance of Ulysses S. James of Helena. James began his Helena career in 1888 as a patternmaker for the Stedman Foundry and Machine Comapny, of which Anton Holter, and N. Kessler where presidents. In 1894, James became manager, and in 1895 became president of the Helena Iron Works, which among other things, made mining machinery. That company went out of business in 1898, but by 1899, James was the vice-president of the James-Bell Concentrator Table Company, which lasted two years. From 1900 until 1908 when he moved to Butte, James worked as a machinist in Helena.[261] James did not stay in Butte long enough to be listed in a city directory. He soon moved on to Newark, New Jersey, where he ran a business manufacturing mining machinery.

James was a inventor of mining machinery. His first patent (with Robert Bell) was filed while he was still in Helena. It was for a new type of concentrating table.[262] By 1911 he was in business in Newark, New Jersey and had developed a more refined concentrating table.[263] James concentrating tables were used at Jardine. As late as 1927, James was developing new equipment for the processing of ores (vibrating screen for sizing of ores).[264]

After various Bush companies were bought by the Kimberly-Montana Mining Company in 1903, the Revenue Mill was finally put into service, a cyanide plant was completed, and the operations began to produce the sheelite ore as well as gold.[265] The Revenue Mill went through periodic changes as mining technology changed, but the stamps themselves were used up until at least 1934.[266] The mill building was in use until the operations closed for good in 1948.

Overall dimensions of the Revenue Mill are about 92' (N-S) by 120' (E-W). Unlike the other buildings in camp, it is on an almost true N-S axis, with the operations running downhill to the west. The mill is of post and beam construction sitting primarily on massive stone foundations. Roofs are supported by wood combination trusses. At the upper end, the newer wooden ore bins sit on concrete foundations. The walls of the mill are sheathed with vertical planks and most of the roof with corrugated sheet metal. The mill is amply lit with numerous six-over-six double hung sash windows.

Beginning with the upper end of the operation, the mill is entered by a tramway from the hill supported by a wood trestle. The tram enters the new ore bins at their SE corner through an enclosed "vestibule." The tramway carried ore cars right over the top of the bins. The bins emptied out the bottom and to the east into a below-grade hopper in which ore was probably broken before being conveyed to the next set of bins and stored for crushing and milling. The roof over the hopper has been removed, probably when the equipment within was removed by the Blankenship salvage operation. These new ore bins were probably built about 1934.[267]

Beyond the new bins, the tramway ends above the original bins in the smaller tower which can be seen in older photographs before the new bins were built. This tower still stands, but the bins below have been covered. North of the old and new bins are the boiler room and a large open room, the use of which is not known at present. While the main ridge lines of the roofs over the mill run north-south, an extension of the boiler room to the east is covered by a gable roof perpendicular to the rest. The steel stack of the boiler protrudes through this latter roof. This is a configuration similiar to that seen in photos prior to the new bins. Modifications from the earlier photos include an extension on the stack and the addition of a dormer just to the east of the stack. The roofs over the boiler room are covered with wood shingles.

West of the above ore bins are the bank of bins in which ore was stored between initial breaking and stamping. These are probably original to the mill. Running along the tops of these bins are the remains of the distributing belt which would fill the bins with ore after it had been broken or passed through the grizzlies. By keeping these bins full, the stamps could process ore for a 24-hour period in the event of a shutdown of the breaker or an interruption in the supply of ore from the mines.[268] These bins emptied out the bottom and to the west, originally into the stamps, but in later years, into the ball mills. The large open floor to the west of the bank of bins contains several ball mill footings, but none of the actual equipment. There are no signs of the stamp batteries. The amalgamating plates probably sat on this same floor to receive the crushed ore immediately as it came out of the stamps.

The last level, that to the west of the stamps, probably housed the concentrating tables and vanners, devices for concentrating the refactory ores for shipment to the East Helena Smelter. The flow sheet provided by Robie[269] includes five "James tables." (Appendix II) these may very well have been concentrating tables made by U.S. James, either at his business in Helena, or in his later operations in Newark. This last level presently contains a centrally-located outline of a large cylindrical tank (perhaps a cyanide vat) and some flotation equipment. Off the SW corner of the mill building is some additional structural framing. This contains another boiler (still in place) and stack and the accompanying coal bin. Exterior sheathing is all but gone on this later bit of the mill building.

Since virtually all the mill equipment has been removed from the Revenue Mill, the most interesting remains are the structure itself. It is interesting because it provides the broad outline for the milling of ore as described above. And it is interesting because of some of the massive elements of the mill, particularly the stone foundations and the timbers. Six hundred perch (one perch equals approximately a cubic yard)[270] of stone were used in the construction of the Revenue Mill. Most of it was used for the larger 92 foot long retaining walls between levels of the mill. It was essential that a mill be built on a sound foundation to withstand the continuous shocks caused by the dropping of the stamps. The vessel which held the ore, and into which the stamps dropped, was called a morter, which in turn sat on mortor blocks. Unless the blocks sat in a sound foundation, the entire stamp battery would soom vibrate itself loose from its moorings.[271] Furthermore, firm foundations were needed to which to anchor the bins and other parts of the mill adjacent to the stamps, lest they, too, be shaken loose.[272]

Because the roofing and wall sheathing are still in relatively good condition, the timber framing of the mill structure is in very good condition. The Revenue Mill was built according to conventional mill construction practices. Some of the posts supporting the ore bins are as large as 12" x 12" and many of the wood members are connected with varieties of wood joinery and secured with wood pegs. Trusses carry the roof spans over the interior spaces. For example, the trusses over the lowest level of the mill span 44 feet. Unlike the Arsenic Plant trusses, which are entirley constructed of wood, the Revenue Mill roof trusses employ iron tension members (Figure 114).

The Revenue Mill was less damaged by the salvage effort than was the Arsenic Mill. It stands today as one of the oldest, largest, and soundest stamp mill structures in Montana. Figures 82-112 provide photographic documentation of the Revenue Mill. Figures 113-114 are architectural drawings of the Revenue Mill.

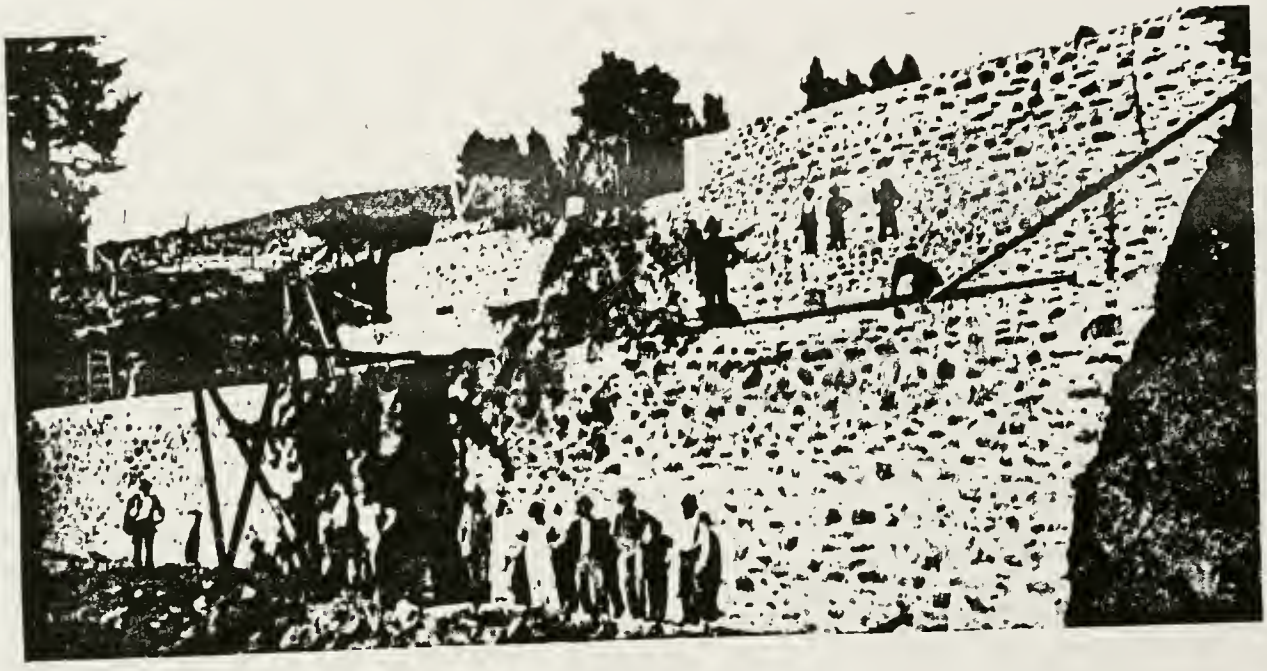

Figure 80. Revenue Mill under construction, 1899, stone foundation. (photograph courtesy of Bill and Doris Whithorn, Park County Museum, Livingston, Montana)

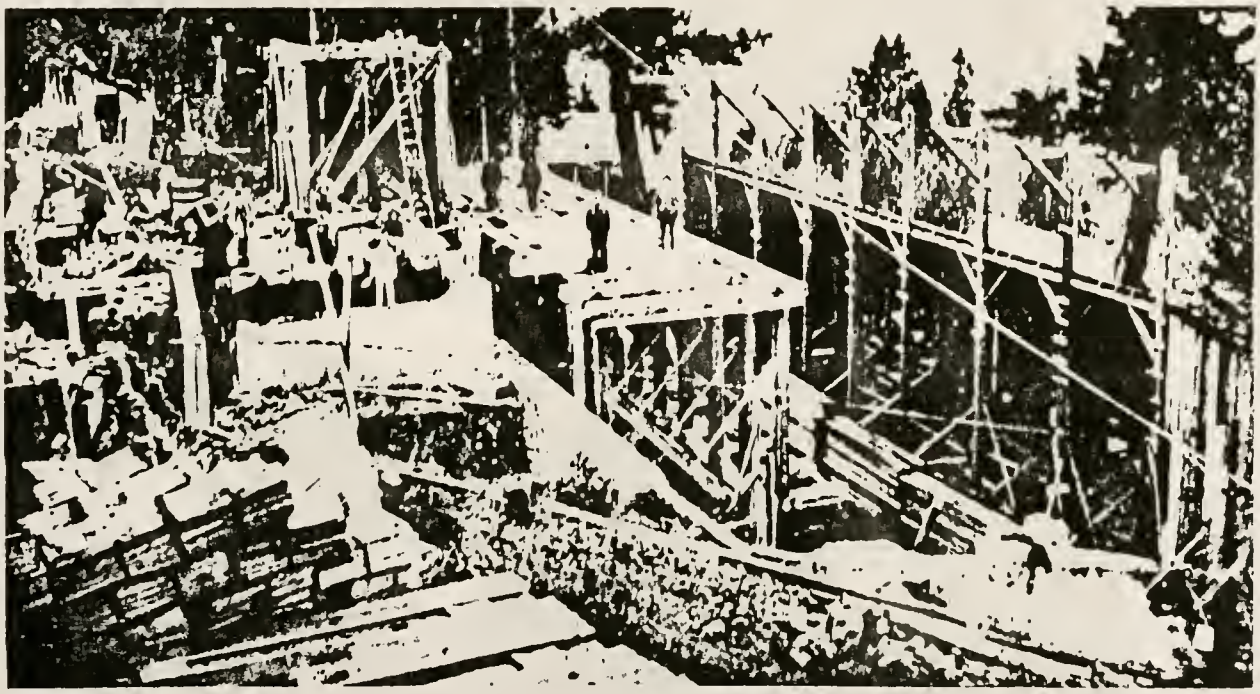

Figure 81. Revenue Mill under construction, 1899, (photograph courtesy of Bill and Doris Whithorn, Park County Museum, Livingston, Montana).

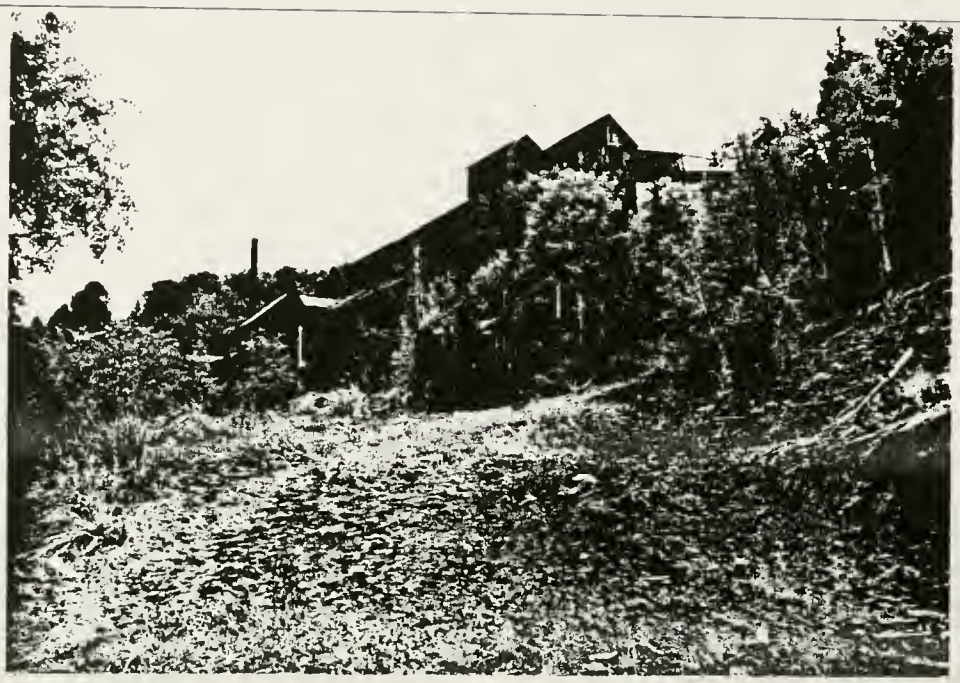

Figure 82. Revenue Mill (structure #34), north view.

Figure 83. Revenue Mill (structure #34), north view showing new ore bins and tramway entering east side of mill.

Figure 84. Revenue Mill (structure #34), north view.

Figure 85. Revenue Mill (structure #34), south view showing east side of new bins and former below-grade hopper area.

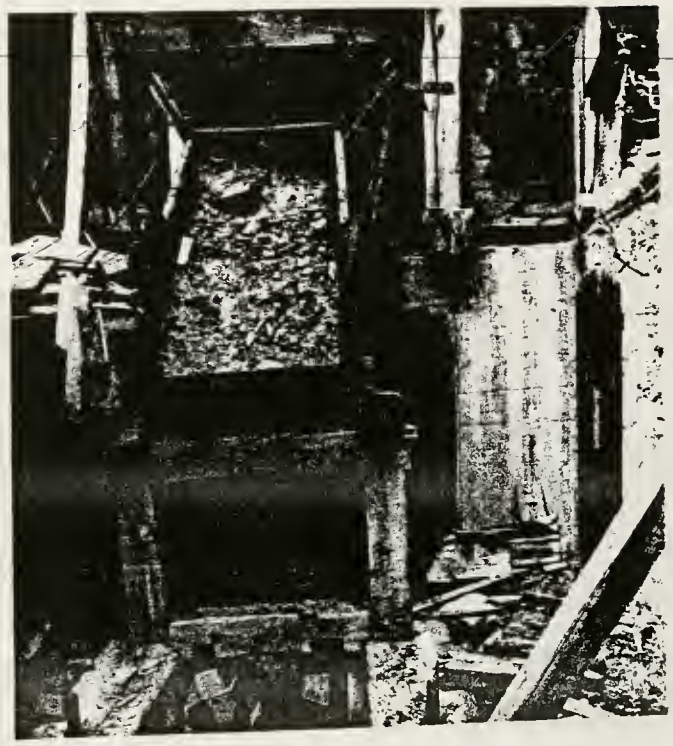

Figure 86. Revenue Mill (structure #34), west view showing detail of the chute which emptied the new bins into the hopper.

Figure 87. Revenue Mill, north west view of upper end of mill showing original boiler stack.

Figure 88. Revenue Mill outhouse, north view.

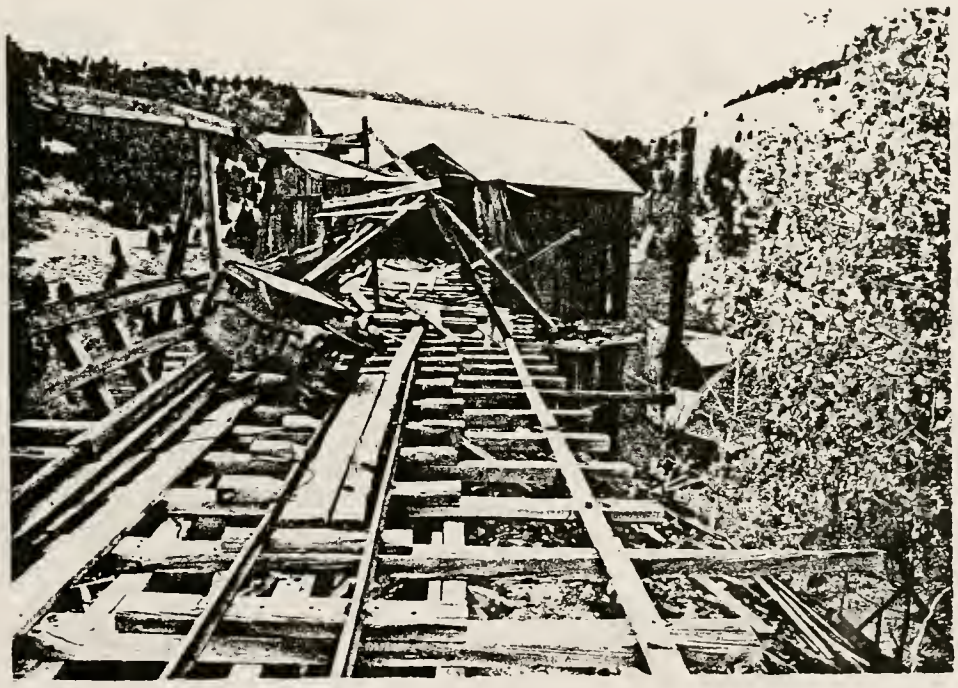

Figure 89. Revenue Mill (structure #34), west view of tramway entering upper level of mill.

Figure 90. Revenue Mill (structure #34), upper level of mill showing tramway over new ore bins (foreground) and original ore bins (background).

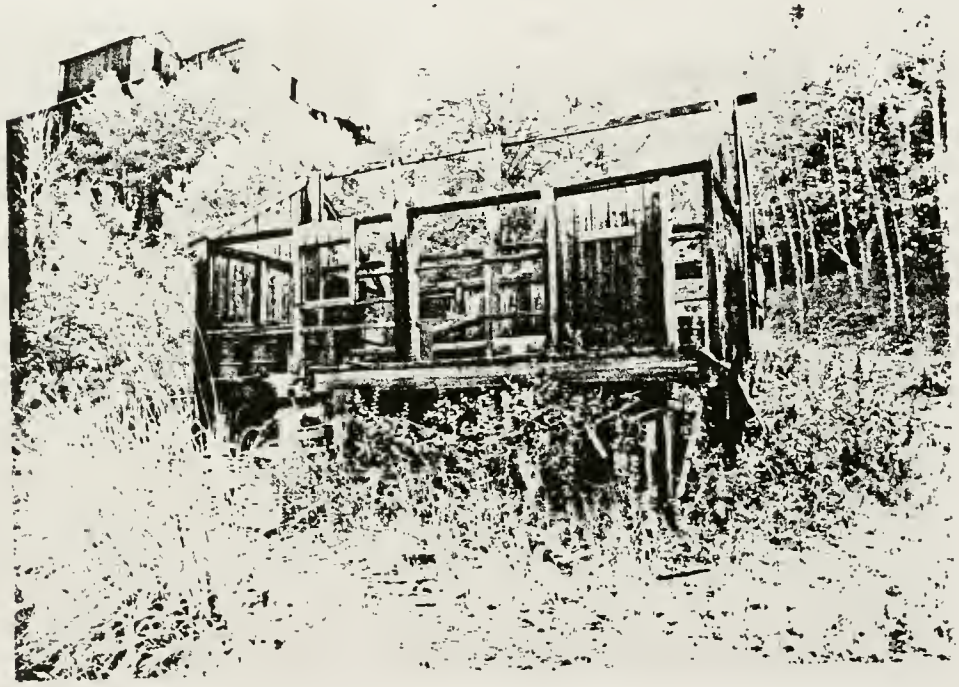

Figure 91. Revenue Mill (structure #34) in background with small wood frame ancillary structure in foreground, northeast view.

Figure 92. Revenue Mill (structure #34) north view stamp mill and ball mill level - concrete footings for ball mill seen in center (arrows).

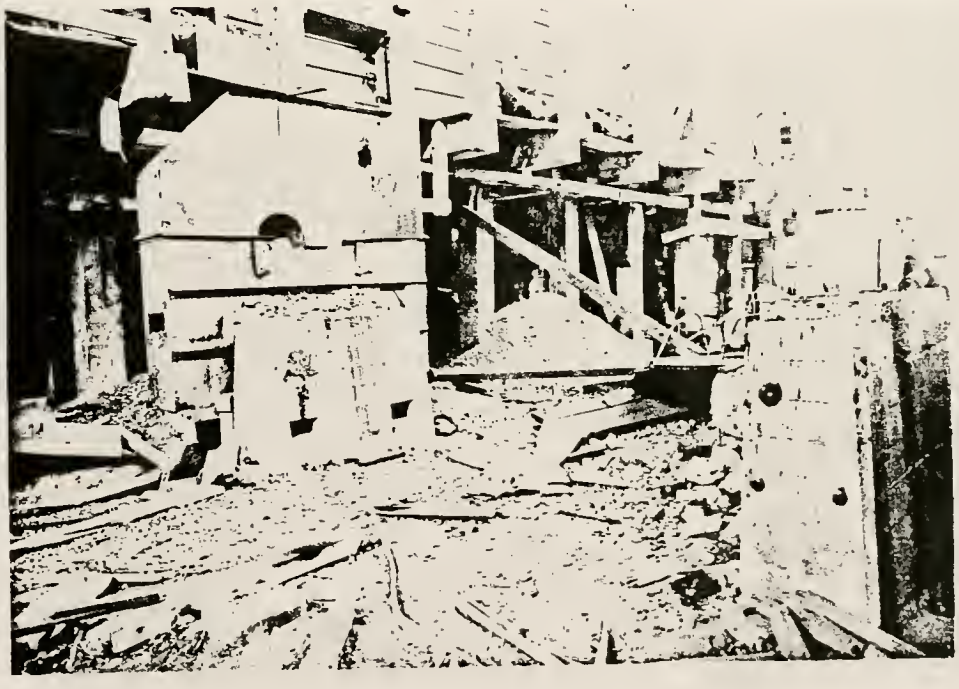

Figure 93. Revenue Mill (structure #34), concrete footings for ball mill, west view.

Figure 94. Revenue Mill (structure #34) interior view looking south that shows shoots (A) that fed into ball mills (B).

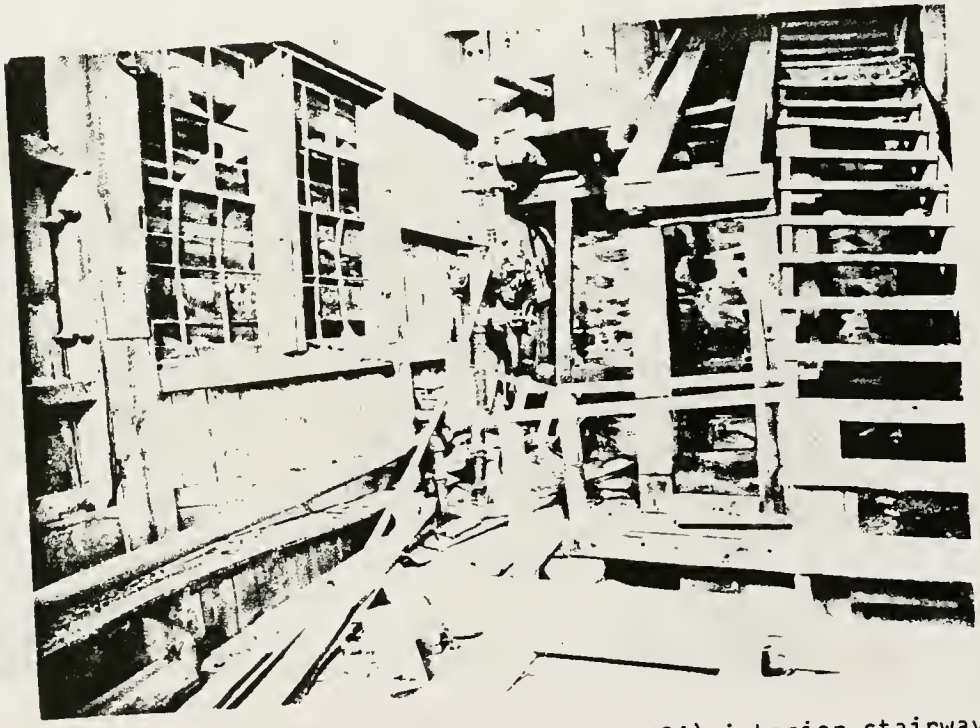

Figure 95. Revenue Mill (structure #34) interior stairway on south side, steam pipes visible in center.

Figure 96. Revenue Mill (structure #34) interior of upper level showing wooden fly wheels that drove stamps.

Figure 97. Revenue Mill (structure #34) interior of upper level, looking south at the timber substructure of the new ore bins.

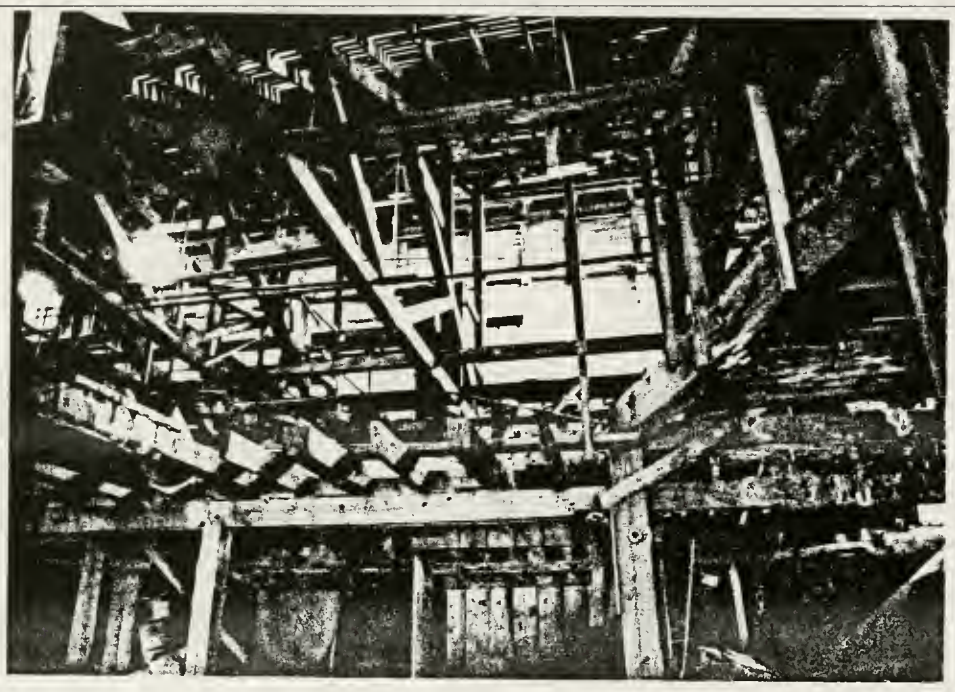

Figure 98. Revenue Mill (structure #34) interior flotation level showing trusses above, looking east.

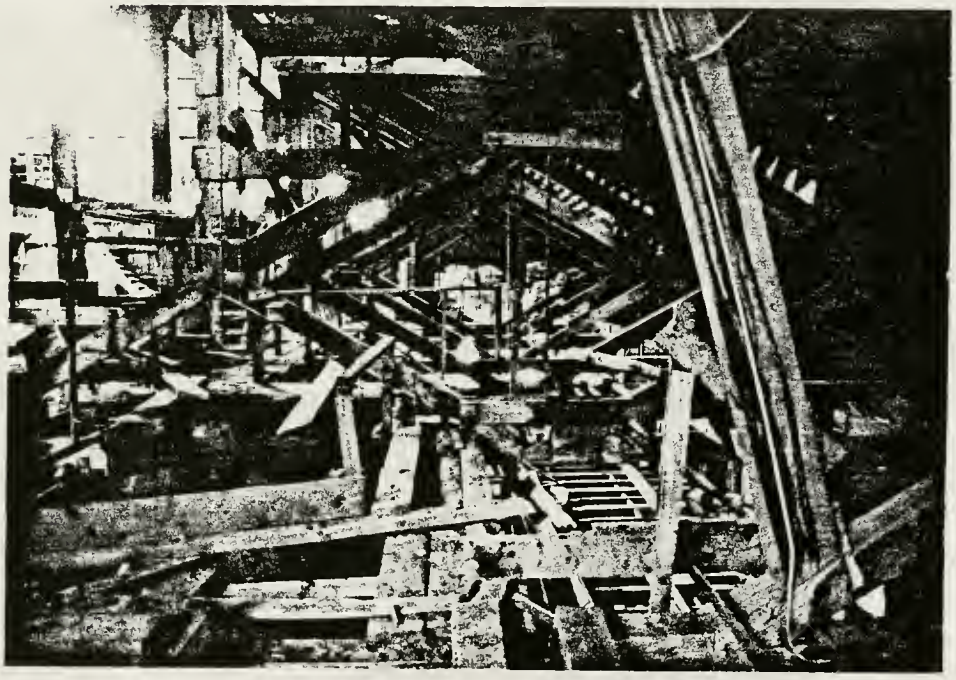

Figure 99. Revenue Mill (structure #34) interior trusses above flotation level, looking south.

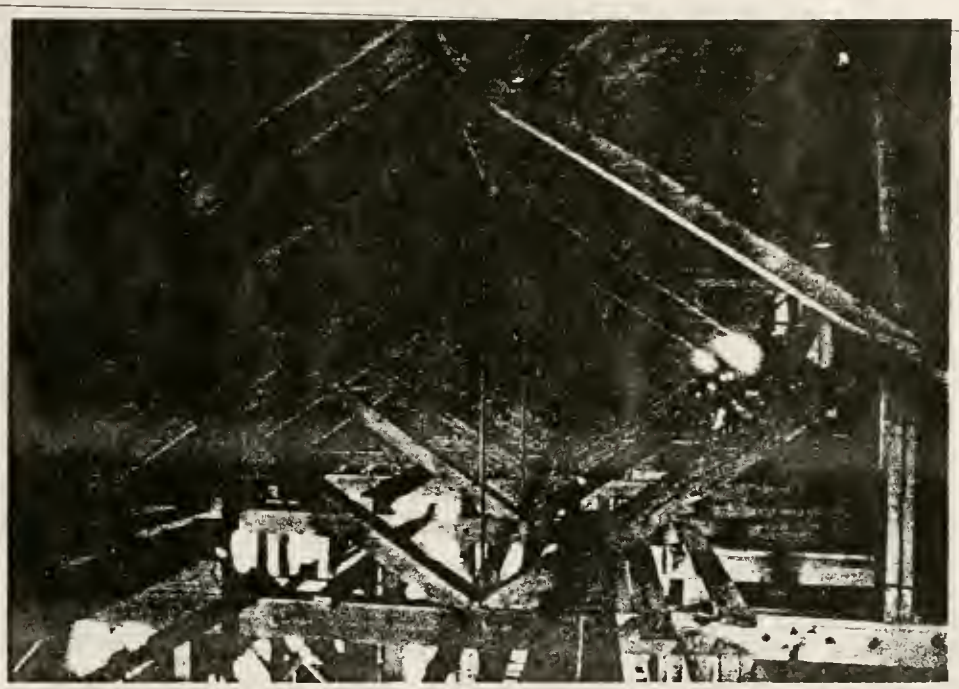

Figure 100. Revenue Mill (structure #34) interior view, looking north of the rod trusses over the stamp mill level.

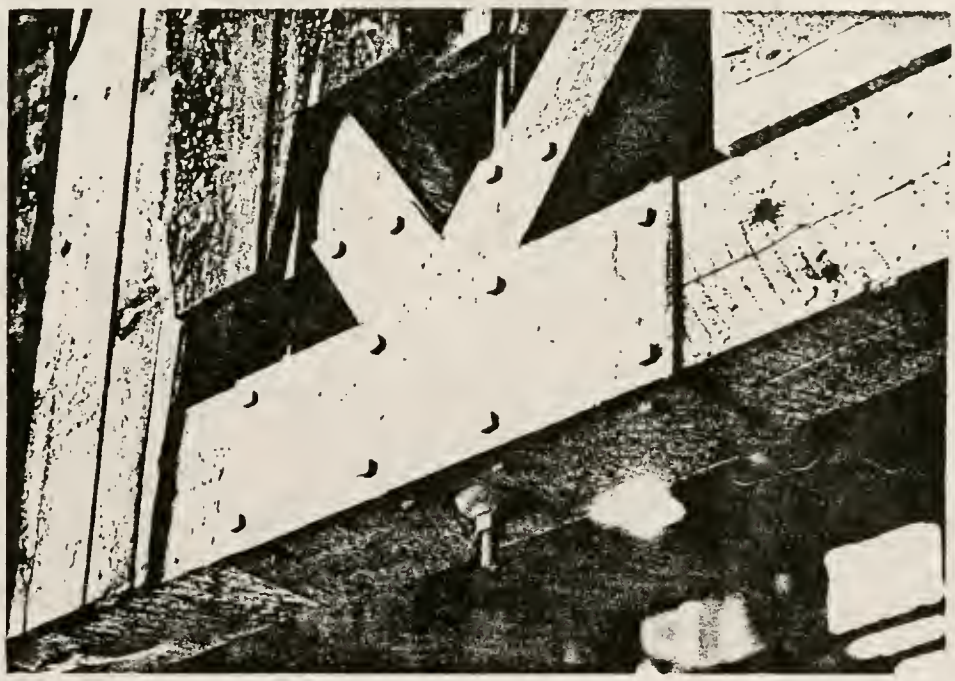

Figure 101. Revenue Mill (structure #34) detail, showing typical junction of the lower chord, diagonals in compression and vertical in tensions, of the rod trusses.

Figure 102. Revenue Mill (structure #34) interior - upper level - north end, east view.

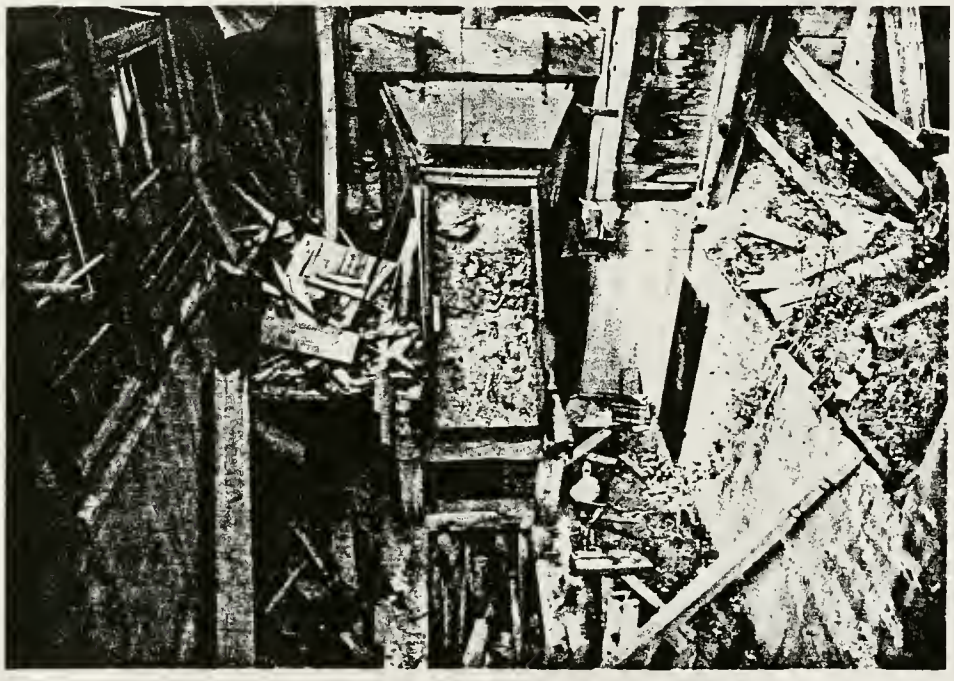

Figure 103. Revenue Mill (structure #34) another view of the below - grade hopper east of the new bins.

Figure 104. Revenue Mill (structure #34) showing the distribution belt mechanism over the ore bins that fed the stamp mills.

Figure 105. Revenue Mill (structure #34) interior - below flotation level - showing foundation rim of probable cyanide tank.

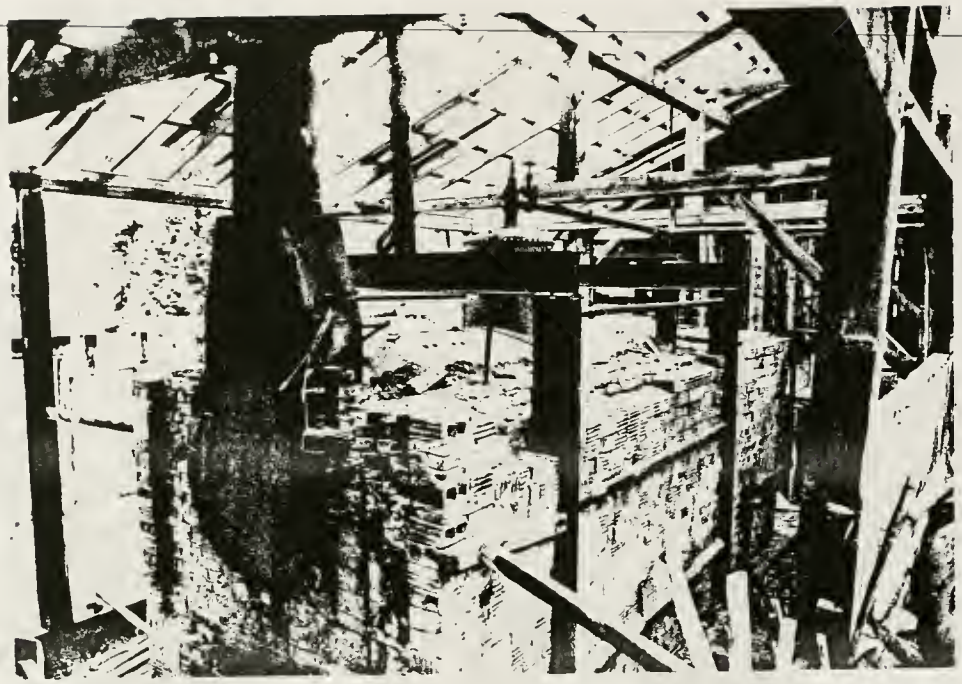

Figure 106. Revenue Mill (structure #34) showing steam boiler at south west corner of the mill.

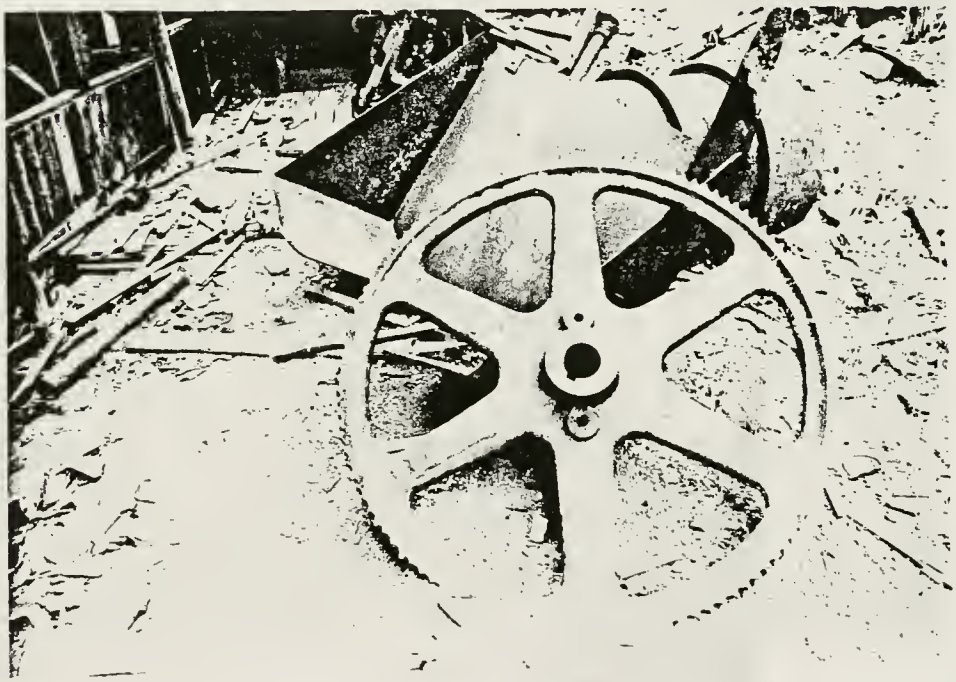

Figure 107. Revenue Mill (structure #34) showing bear wheel and piece of metal chute.

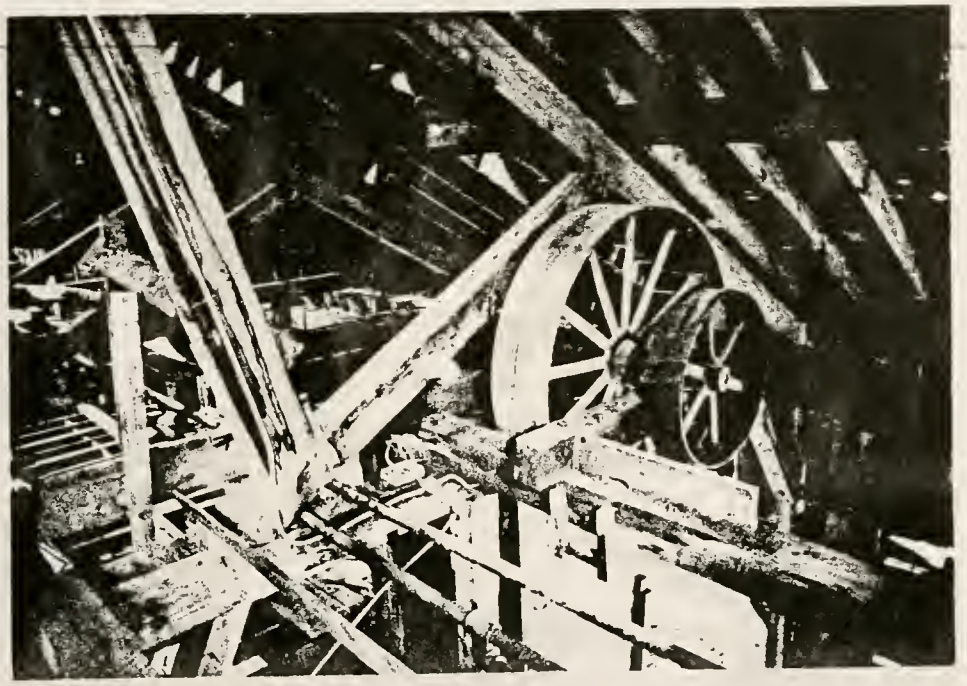

Figure 108. Revenue Mill (structure #34) belt pulleys for overhead power distribution system.

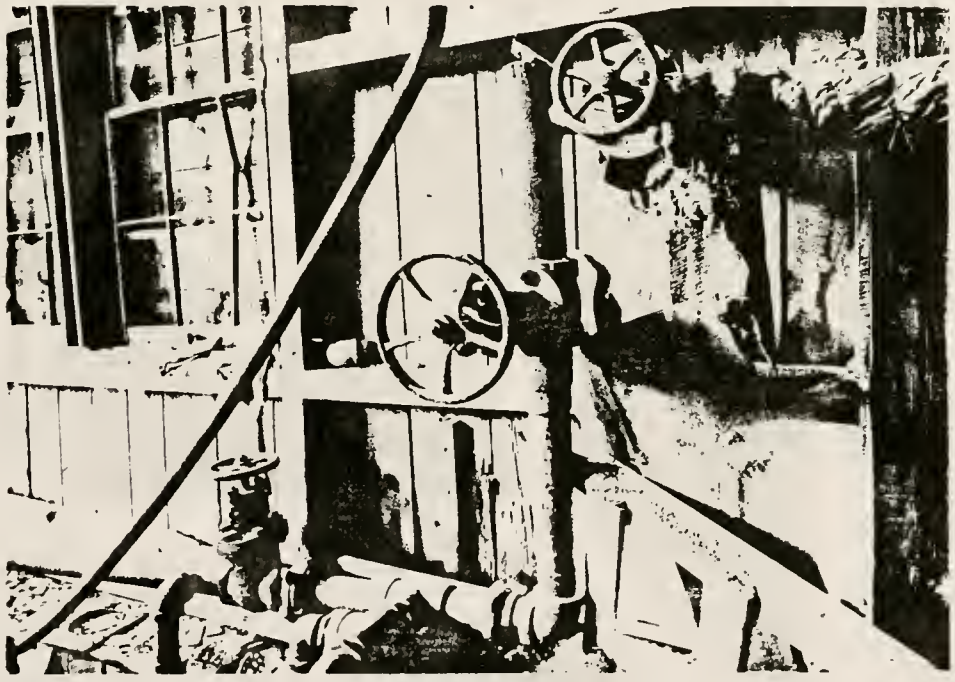

Figure 109. Revenue Mill (structure #34) interior steam pipes and valves.

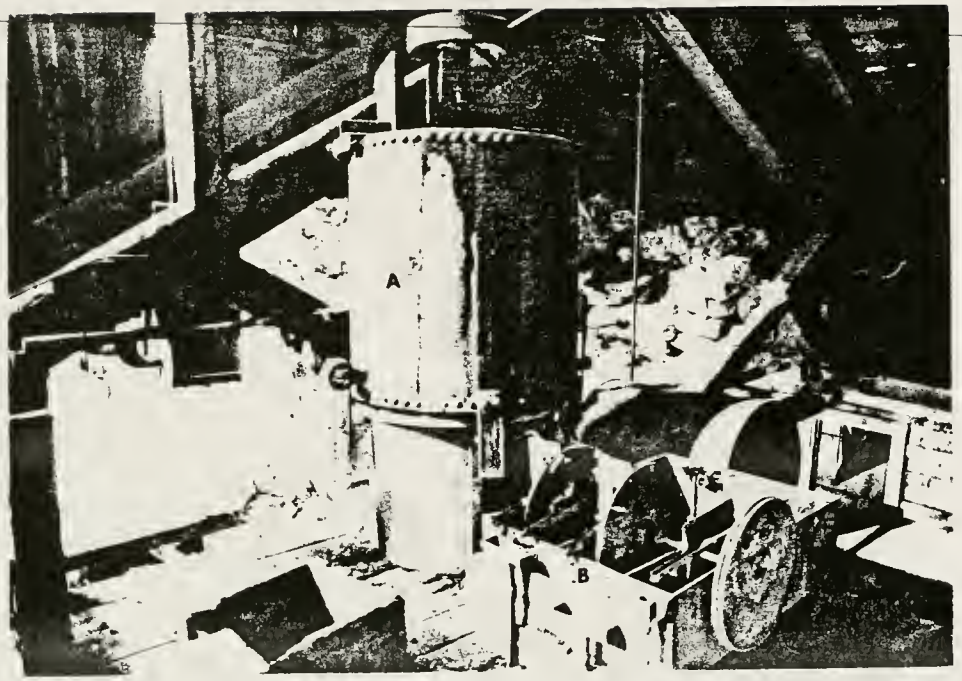

Figure 110. Revenue Mill (structure #34) interior - above flotation level showing lime mixer (A) and reagent feeder (B).

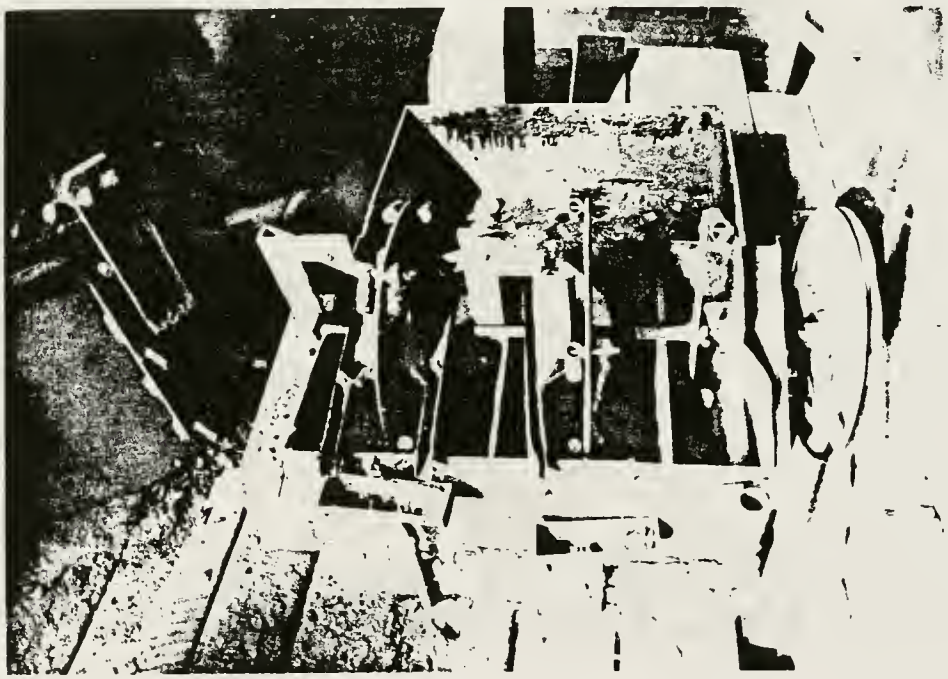

Figure 111. Revenue Mill (structure #34) flotation level showing reagent feeder.

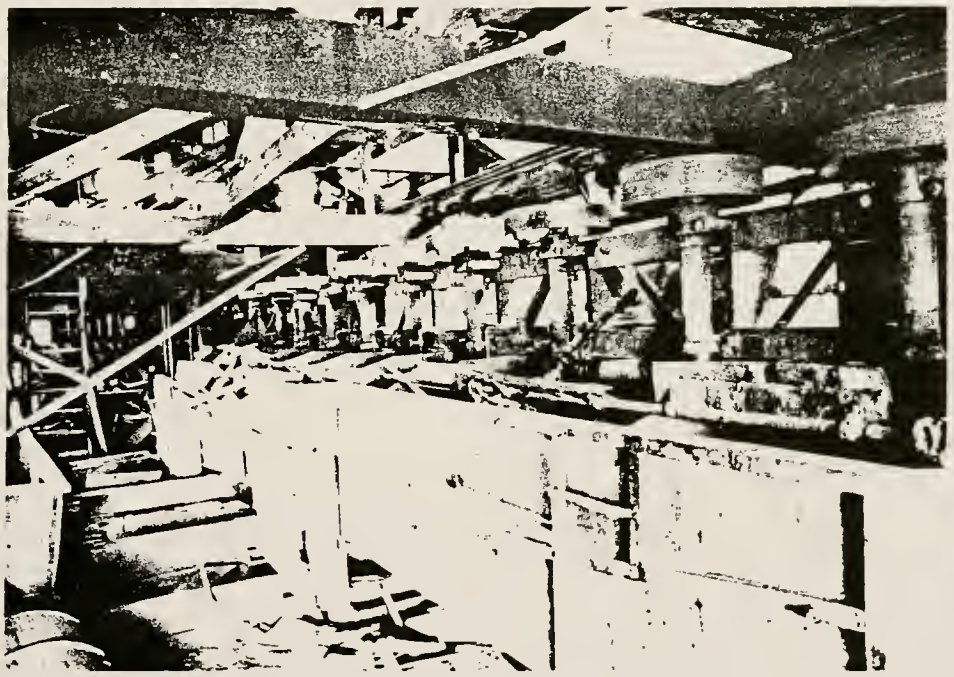

Figure 112. Revenue Mill (structure #34) interior - flotation level showing flotation unit in place.

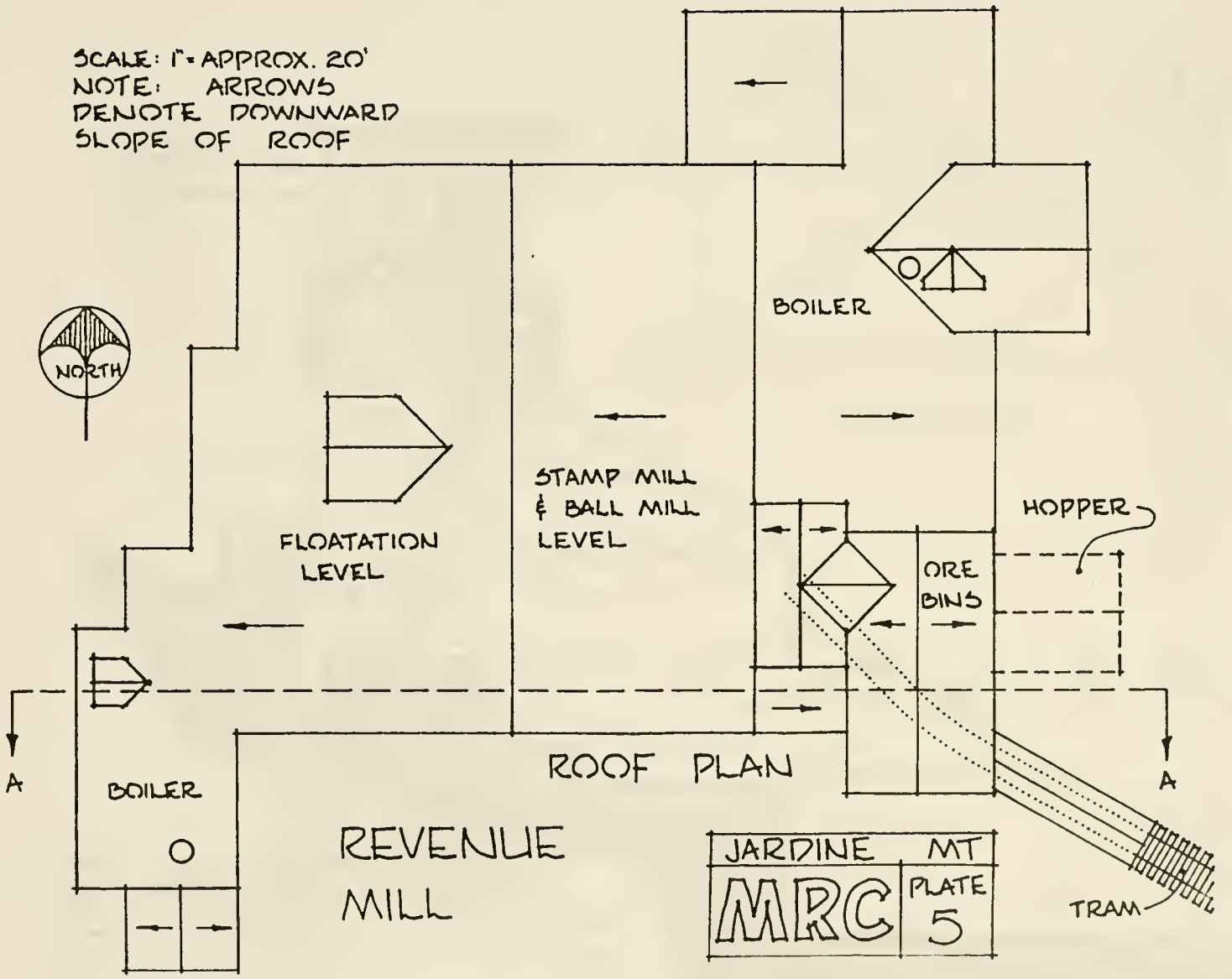

Figure 113. Revenue Mill (structure #34) architectural drawing plate #5.

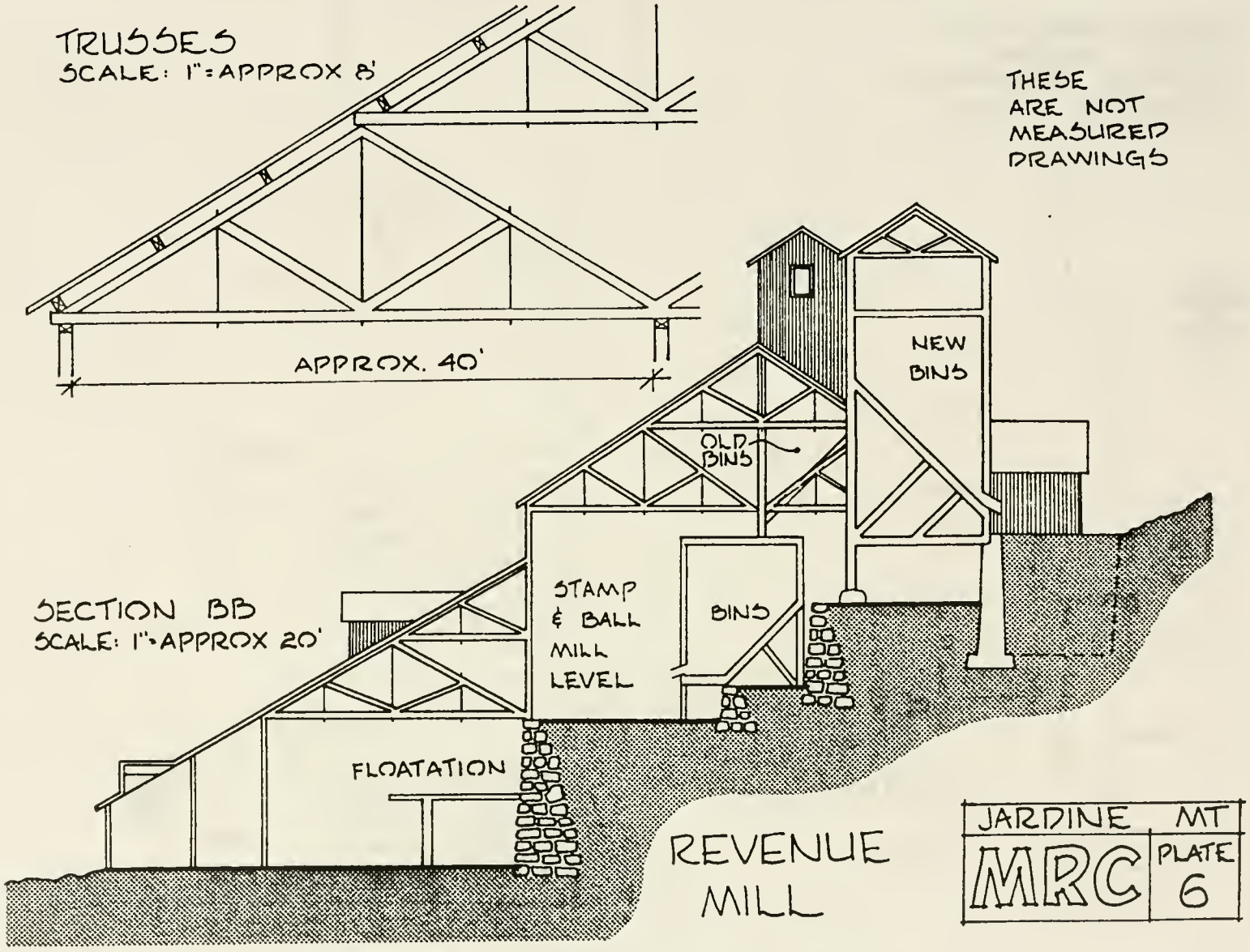

Figure 114. Revenue Mill (structure #34) architectural drawing plate #6.

Structure #35 (Figure 115) consists of a series of badly deteriorated concrete and wood building foundations and a trash scatter that includes tin cans, oil cans, rusted 50 gallon drums, automobile parts and small piles of coal.

Figure 115. Structure #35, south view.

Structure #36 (Figures 116-118) is the water tank building which until recently provided water for the town of Jardine. This building enclosing a wooden water tank was built in 1899 - 1900. The water tank is cylindrical about 16' in diameter and of equal height and is constructed of wood staves and steel bands. The tank sits on wood blocks and is sheltered by an 18' x 24' x 20' post and beam, board and batten house with a gable roof. The house and the wood blocking are rotting badly, while the tank itself is in relatively good condition. The tank is empty except for a layer of debris in the bottom. The tank empties through a iron pipe on the downhill side. The pipe runs underground and away from the tank. The tank is filled at the top by a 6" PVC plastic pipe which lies in the remains of a wooden flume which originates in Pine Creek by structure # 164. Both the supply and the drain pipes have been recently insulated with foil - backed fiberglass batt, although it is largely unraveled through weathering. Because of the deteriorated condition of the house and blocks, the water tank is in imminent danger of collapse. The tank was filled originally by water from Pine Creek running through the wooden flume.

Figure 116. Structure #36, west side of water tank building.

Figure 117. Structure #36, east side of water tank building showing remains of wooden flume (A).

Figure 118. Structure #36, wooden water tank.

Structure #37 (Figure 119) is the remains of a major ore station that fed the Revenue Mill by means of a gravity tram that ran straight down the mountain from the station to the mill. Figures 120 and 121 show the tramway that fed ore into the ore station, originating from mines on the hill. The ore station which is partially collapsed was of typical ore bin construction style. This building can be seen in Figure 23 (1899) and Figure 42 (structure L) (1925). The building was constructed between 1899 and 1903.

Figure 119. Structure #37, east view.

Figure 120. Tramway that fed into structure #37 (ore station), north view.

Figure 121. Tramway that fed into structure #37 (ore station), west view.

Structure #38 (Figure 121) is a front-dumping ore car that was used on the the tram that fed ore into structure #37.

Figure 121. Ore car with tram running from structure #37 to Revenue Mill in background.

Structure #39 (Figure 122) is a wood frame, board and batten shed on a concrete foundation with a gable roof that measures 12' x 24' x 10'. This building served as a powder house for the Jardine Mining Company and was probably constructed between 1920 - 1930. The house has been retrofitted by the Homestake Mining Company with interior concrete walls and floors, a new steel door and locks. It is in good condition and fairly unaltered on its exterior except for new asphalt rolled roofing.

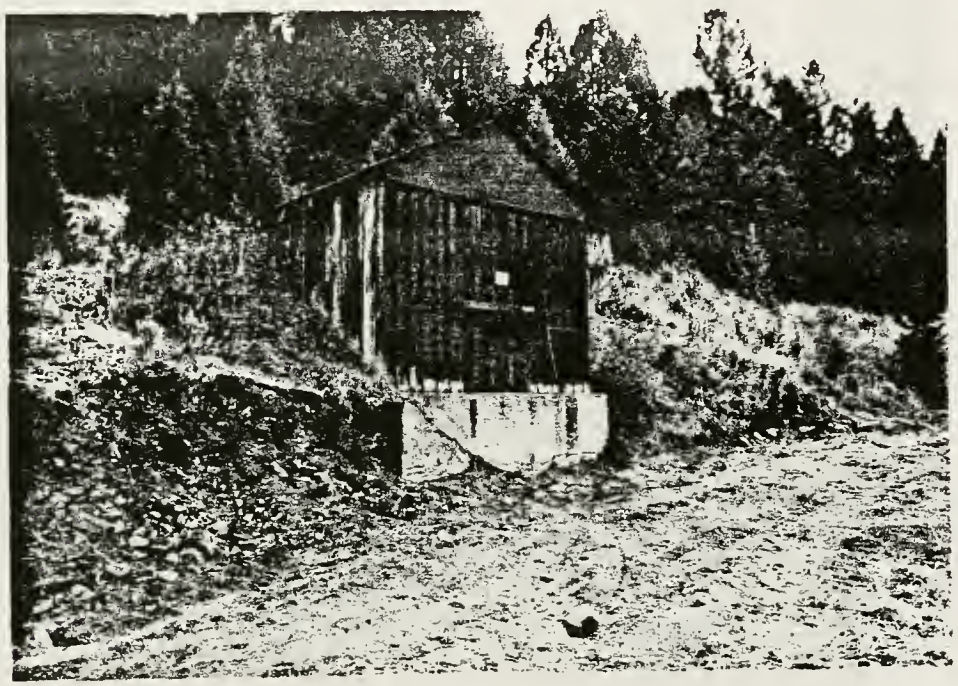

Figure 122. Structure #39, west view.

Structures 40-50 (Figures 123-124) consist of a complex of buildings, mine waste development dumps and discarded equipment centered around two mine adits.

Figure 123. A) Structure #41 - compressor house.
B) Structure #40 - tram station house.
C) Structure #46 - wood frame shack.
D) Structure #50 - dry house
E) Tramway ruins.
(south view)

Figure 124. A) Structure #41 - compressor house.
B) Structure #46 - wood frame shack.
C) Structure #49 - wood frame building.
D) Structure #50 - dry house.
E) Structure #40 - tram station house. (south view)

Structure #40 is a small square wood frame building measuring 10' x 10' x 6' that served as a station control house for the tramway system that led to the Revenue Mill. An operator in this house would divert ore cars to the mill or to waste dumps.

Structure #41 (Figures 125-130) is the compressor house, a 25' x 40' x 9' post and beam structure with a gable roof supported by trusses. Siding is of a double layer of vertical wood boards. There is no apparent foundation. Inside the compressor house set into the dirt floor, are three variously shaped concrete footings for the compressor equipment. Compresed air was used to power the drills in the mines. Centered in each approximately 13' wide wall panel between posts is double hung sash windows (mostly deteriorated), the exceptions being a door in the center panel on the west wall and a door in the west panel of the south wall. Almost the entire south panel of the west wall has been removed, probably during salvage operations. On the southeast corner of the compressor house is a small wood-frame shed which may have been where the miner's lamps were stored.

Figure 125. Compressor house (structure #41), east view.

Figure 126. Interior of compressor house (structure #41), north view.

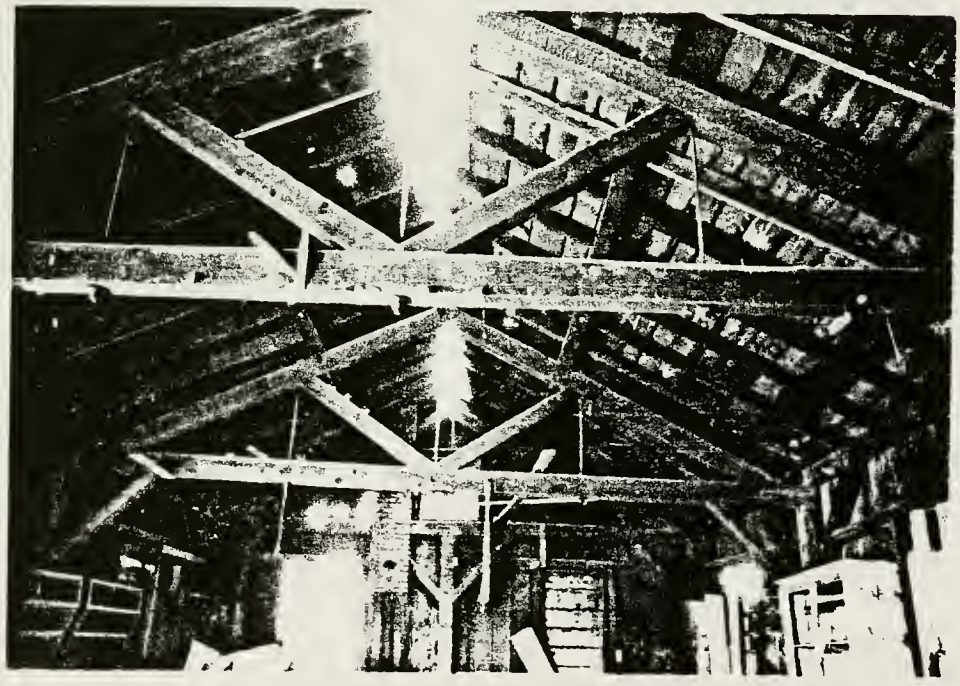

Figure 127. Interior of compressor house (structure #41), north view.

Figure 128. South end of compressor house (structure #41), showing attached miner's lamp shed and collapsed adit-horse tunnel #9 (structure #42), east view.

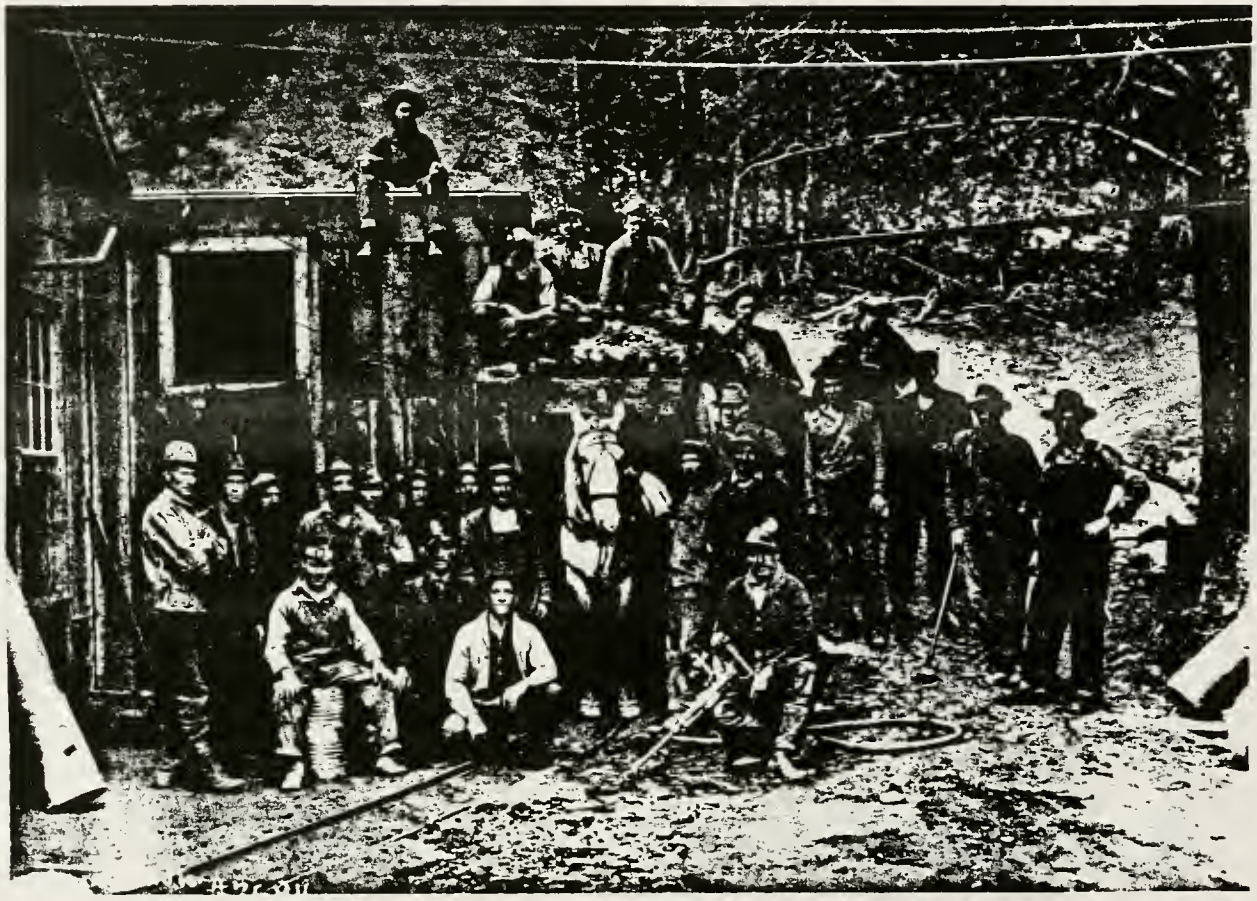

Figure 129. Photograph taken in 1920s, shows same scene as in Figure 128. Arrow indicates Harry Bacorn, mine manager for Jardine Mining Company (1920-1936). Photograph courtesy of Bill and Doris Whithorn.

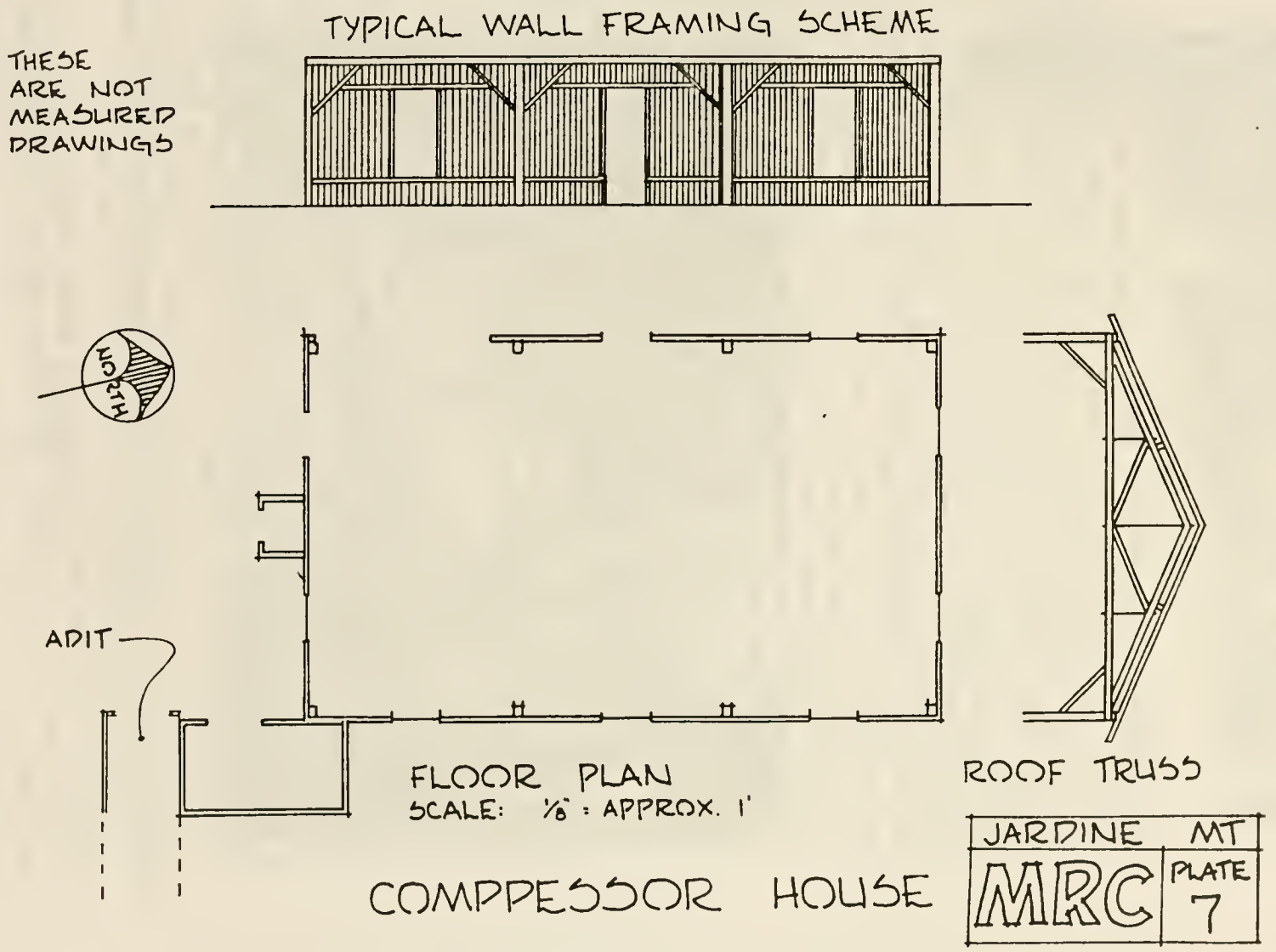

Figure 130. Structure #41 - compressor house.
Architectural Plate #7.

Structure #42 is a mine adit identified as Horse Tunnel #9 in Figures 128-129. The portal is constructed of square timbers and measures 6' x 4'. The timbers are square set at the joints. The area beyond the portal is caved and inaccessible. This adit appears to be located on the Legal Tender Lode Claim (MSN 5529).

Structure #43 (Figures 131-132) is the Blacksmith's Shop. It is a 24' x 60' x 8' post and beam structure with a gable roof, but unlike the compressor house (structure #41), the roof is supported by simple rafters, not trusses. Centered on the roof is a louvered cupola. Siding is a double layer of vertical boards and there is no apparent foundation. Double hung sash are centered in each wall panel, except at the west panel of the north end where a door is located. A lean-to-shed is attached to the south end of the west wall and the ruins of another lean-to-shed are against the south wall. Inside the building is a gas-fired hearth complete with hood and steel chimney. There are numerous tool bins throughout the exterior. The Blacksmith Shop is only a shell and there are large areas of wood shingles missing. The frame of the structure is sound.

Structure #44 is a collapsed and caved mine adit with the reamins of a square-set timbered portal. This is a three room opening into the hillside. Only the front room is exposed to daylight and it has a plank gable roof and corrugated sheet metal siding. The walls of the interior rooms are poles used to restrain the earth. Behind this structure is located a small two-wheeled dirt scraper-grader (Figure 133) also called a Fresno.

Structure #45 is a gable roofed board batten outhouse measuring about 5' x 10'. It features one horizontal pole with a kickboard between it and the wood floor, for a seat, and a second pole which serves a back rest. Abandoned for many years, the outhouse is still in operable condition.

Structure #46 and #47 (Figure 134) are two wood-frame shacks, #46 measures 12' x 30' x 6' with a 10' x 12' x 6' addition on the north side. Inside is some old hose and miscellaneous debris. Behind this shack are some old ore buckets and a pile of miscellaneous debris. The other shack, #47 measures 10' x 12' x 6' and has some coal scattered on the floor and may have been a coal storage shed.

Feature #48 (Figure 135) consists of a wooden trestle that carried ore cars out over the brink of the hill to a waste dump and three mine waste development dumps.

Structure #49 (Figure 136) is a collapsed wood frame building which may have been the mine office building, built in 1933.[273] It is built of 2" x 6" stud construction on a concrete slab. Studs were covered inside and out with a 1" horizontal wood siding which in turn was covered inside and out with corrugated sheet metal siding. The gable roof has asphalt shingles and a louvered cupola overhead. The simple rafter roof had few ties, thus allowing snow loads to spread the walls and collapse the roof. The 25' x 30' x 9' building has two rooms.

Figure 131. Blacksmith's Shop (structure #43), east view.

Figure 132. Interior of Blacksmith's Shop (structure #43), south view. Arrows indicates gas-fired hearth and steel chimney.

Figure 133. Fresno.

Figure 134. A) Structure #46, south view.
B) Structure #47, south view.

Figure 135. Feature #48. Trestle to mine dump, west view.

Figure 136. Structure #49, west view.

Structure #50 (Figures 137-140) is the Dry House located across the road from the Compressor House (structure #41) in which are still found lockers and showers. The Dry is built of 2 x 4 construction on a concrete slab. The exterior walls are sheathed with 1" diagonal boards and corrugated sheet metal. Most of the corrugated siding has been removed. Interior walls are homosote material. The Dry is actually a split level building in a L-shape. The south end is the base of the L and is two stories. The lower level contains a crawl space with shelves, a furnace room and a coal room. The upper level is the locker room. From this upper level, steps go down to the main body, or stem, of the L. This is one room containing lockers and showers. The base of the L is about 20' x 30'; the stem, about 20' x 40'. In addition there is a 15' x 20' concrete slab at the north end of the Dry. The roof over the building is supported by trusses composed of 2" x 6" chords and 1" x 6" webs. Most of the roof decking has been removed. The Dry was built in 1933.[274] All that remains is a shell.

Figure 137. Dry house (structure #50), west view.

Figure 138. Dry house (structure #50), north view.

Figure 139. Interior of Dry house (structure #50), south view.

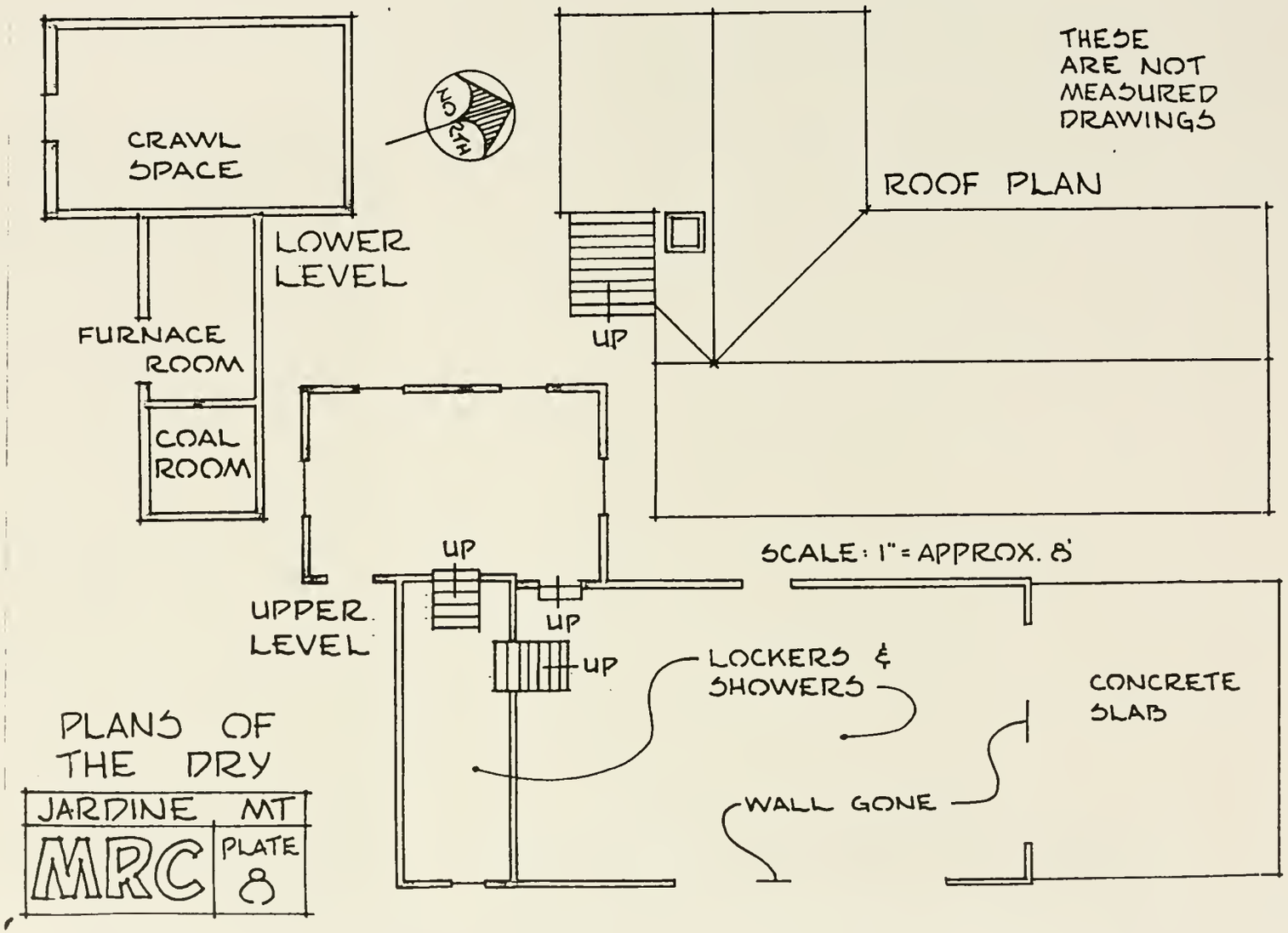

Figure 140. Dry house (structure #50). Architectural Plate #8.

Feature #51 consists of two wooden fly wheels that probably drove stamps in the Revenue Mill but were moved in later years.

Feature #52 is a wooden sluice box from a placer operation.

Feature #53 (Figures 141-142) consists of several collapsed structures that were part of a sawmill complex. All that remains of this complex is a 12' x 20' x 6' post and beam shed with vertical plank exterior sheating and a wood shingle gable roof, several piles of sawmill debris and some deteriorated frameworks. Just below (west of) the sawmill complex is a large pile of sawdust and wood chips. Extending out into this pile from the shed is the deteriorated super structure of the conveyor system for removing sawdust and chips from the mill. Just north of the sawdust and chips pile is a large pile of scrap lumber. Off the northeast corner of the mill shed is a third pile of slab wood. Northeast of this latter pile are the ruins of a post and beam structure, probably the lumber shed. This is undoubtedly the sawmill at which mine timbers were milled. From here, timbers were hauled by horse cart or trucks to the lower mine tunnels and by hoist to tunnels higher up the mountain.

Figure 141. Sawmill complex (feature #53) west view.

Figure 142. Sawmill complex (feature #53) north view.

Structure #54 (Figures 143-144) is the Electric Substation or transformer house. The Electric Substation stands at the brink of the hill overlooking the Arsenic Plant. It is about 13' x 25' and of post and beam construction. It has board and batten siding and a gable roof. The cupola atop the roof has no louvres, but rather was used as the point of entry for the power lines from the hydroelectirc plant three miles down Bear Gulch. The 400 horse power (about 300 kW) plant was built in 1903 to deliver power to the Jardine mining operation.[276] The substation was likely built about 1903 when Kimberly-Montana made its many improvements.

The most interesting feature of the substation is the hoods over the three south facing windows. These are comprised of extensions of the eaves over each of the windows and triangular fins at each side of each window which connect the bottom of the window openings with the extended eaves. These hoods were probably built as solar shading devices to protect the interior electrical gear from overheating during sunny days. With two windows on the north side as well, the operable one-over-one double hung sash would have provided ample cross-ventilation for cooling the equipment inside. Aside from miscellaneous artifacts such as ceramic insulators, none of the electrical equipment remains in the substation.

Figure 143. Electric substation (structure #54), northwest view.

Figure 144. Close-up of shaded windows on electric substation (structure #54), northeast view.

Feature #55 (Figure 145) is the collapsed remains of a stone-lined beehive shaped oven with a iron-plate chimney protruding from it.

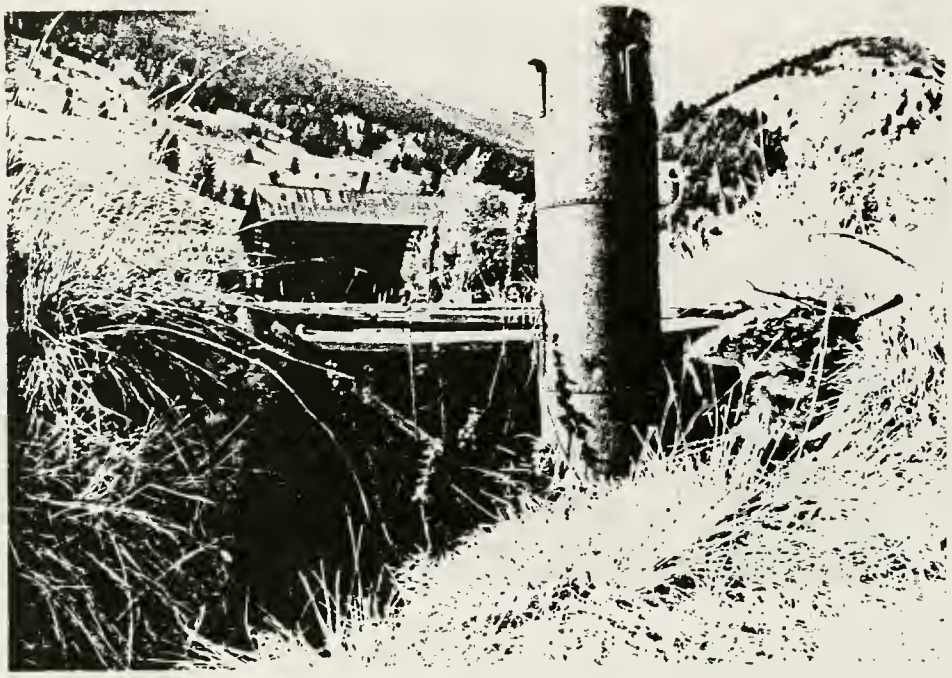

Figure 145. Beehive oven and stack (structure #55), west view.

Structure #56 (Figure 146) is a small dilapidated wood frame shed measuring 6' x 15' x 7' with a wood shingle gable roof. Presently used for core sample storage.

Figure 146. Structure #56, east view.

Feature #57 is a large pile of burned metal machinery parts from the burned cyanide mill.

Structure #58 (Figures 147-149) is the Assay Office which sits just to the southeast of the Arsenic Plant. It is of post and beam construction with no foundation. The main body of the building is 25' x 55' with board and batten siding and a wood shingled gable roof. A 12' x 12' shed roof addition is at the north end of the west side. The main body of the Assay Office is divided into two rooms, a 15' room at the north and a 40' room at the south. This 25' x 40' room is the original structure and was built about 1902. Two wood trusses span the space of the larger room. These, however, do not support the roof, but only the interior workings such as the overhead axle and belt wheels which are still in place. In the southwest corner of the larger room is a small partitioned space finished in beaded ceiling. The building has three chimneys, a large brick chimney which sits on ground near the southeast corner, and two smaller brick chimneys which are bracketed to the walls. In the southwest corner of the north room are two hoods over a work space made of tongue and groove boards.

The Assay Office has been abandoned for years and is in a state of deterioration.

Figure 147. Assay office (structure #58), east view.

Figure 148. Interior of Assay Office (structure #58), north view.

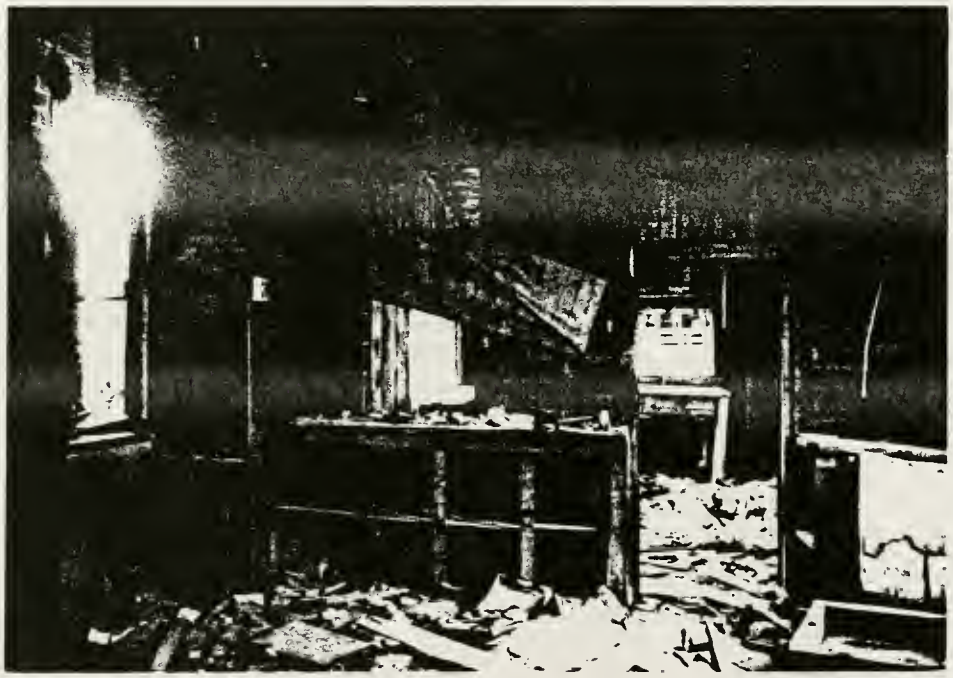

Figure 149. Interior of Assay Office (structure #58), southview. Note wooden hood for venting chemical fumes.

Structure #59 (Figures 150-177) is the arsenic plant constructed by the Jardine Mining Company in 1923, shortly after prices for arsenic doubled in 1917 as a result of its use as a pesticide to control boll weevil infestation in southern cotton fields. Much of the equipment has been removed.

The first plant in the U.S. to produce arsenic was built in Everett, Washington, in 1901.[277] The first arsenic plant in Montana was built in 1919 when, as a result of increased arsenic prices, the Anaconda Copper Mining Company added a plant to its smelter in Anaconda to recover arsenic.[278] Because of the higher arsenic prices, many mining operations installed arsenic plants, increasing supply until 1925 when prices suddenly dropped to pre-1917 levels.[279] The Jardine plant operated continuously between 1923 and 1926 and intermittently until 1936 when plans were made to dismantle it.[280] During this period, Montana and Utah were the major producing states.[281] There was some arsenic production during World War II as well.

When it was installed, the Jardine Arsenic plant was claimed to be one of the most modern and complete in the U.S. at the time. Prior to construction of the Jardine arsenic plant, the company shipped concentrates to Tacoma, Washington, where they were processed. Arsenic was recovered, but the Jardine Mining Company was penalized for the arsenic content in the concentrates. By installing the arsenic mill to roast arsenic out of the concentrates before shipping, the company was able not only to realize a return on the arsenic, but to save shipping costs as well. The Jardine arsenic mill could process about 20 tons of concentrate per day, producing approximately 7.5 tons of arsenic.[282]

The arsenic plant was installed into the old cyanide plant, construction of which was started in 1899 by the Bush Companies.[283] Construction was delayed as a result of Bush's financial difficulties and legal battles.[284] The old cyanide plant was finally completed in 1903.[285]

The arsenic plant is built into the hillside which slopes down westward into Bear Gulch. Overall dimensions of the mill in plan are about 100' (E-W) by 150' (N-S). Total height from the lowest point near the creek to the highest point of the structure is about 90 feet. The structure is built entirely of post and beam construction with wood trusses supporting the roof and vertically mounted plank siding. The foundations are of field stone, as are the north-south retaining walls which separate the building into its various levels. The mill is amply lit with numerous six-over-six double hung sash windows. Virtually all of the retrofitted arsenic equipment has been removed and some portions of the mill structure have been destroyed to make way for tht salvage operation.

Some of the apparatus is still in place, however, and therefore some aspects of the arsenic recovery process can still be traced. After having been processed at the concentrating mill, concentrates were loaded into a 16' diameter McDougall roasting furnace (coal fired). This is still in place in a chamber at the northwest corner of the arsenic plant. This furnace reached temperatures between 550° and 600° C. Gases eminating from the furnace contained the volatized arsenious oxide. Arsenious oxide will condense at about 218° C to a white powder. To accomplish this, the gases were passed through specialized flues known as kitchens.[286] The first kitchen through which these flue gases

passed is still in place. It is 72' long, 14' tall along the east side, 21' tall along the west. Constructed of hollow clay tile, this kitchen has six iron baffle plates along its length which sent the gases along a serpantine path. The floor of the kitchen slopes westward toward a series of discharge gates. These were used to discharge the powdered condensate from the kitchen and can be seen along the west wall of the arsenic plant from the creek. From this kitchen, the gases passed back alongside it to the north end of the plant through a smaller kitchen. Evidence of this kitchen can be seen, but it is mostly destroyed either by later plant remodeling or by the salvage effort. From the north end, the gases passed through two additional, small kitchens, and then passed out of the plant through a wooden flue, up the hillside to a steel stack. A portion of the wooden flue at the northeast corner of the plant near the roof is still in place. Some of the flue along the hillside also remains, but the stack is gone. Flue gases entered the first kitchen at about 225° and exited the stack at about 70° C.[287]

The powdered condensate that was removed from the above-described kitchens was about 90% arcenious oxide and was called crude arsenic. Because crude arsenic was less marketable than refined arsenic, the Jardine Mining Company resublimed (vaporized) the crude arsenic in two reverberatory furnaces. The smaller of the two was used prior to the installations of the McDougall roaster for the production of both crude and refined arsenic. A specialized refining furnace was completed in 1924, relegating the smaller unit to a back-up role. Neither of these two furnaces remain in the arsenic plant. However, amidst the ruins of the Cyanide Mill, right next to the arsenic plant, are a concrete furnace and steel flue which are identical to a 1925 photo of the refining furnace in the Robie article. The clay tile upper portion of the furnace (first kitchen) has been destroyed, however. Seven tons of refined arsenic (99.6% pure) could be produced daily by the Jardine plant.[288]

Although the post and beam structure of the arsenic plant is still basically sound, the building is in ruins. The arsenic plant foundation was breached on the south side during a joint clean-up of potentially hazardous waste materials by the Anaconda Company and the Homestake Mining Company. Aside from the structure itself, all that remains are the above-described features plus a bin and bucket elevator near the McDougall roaster, a massive concrete tower on the main floor of the plant, and miscellanous pieces of scrap. The concrete tower is 20' x 24' and about 40' tall. There are two chambers inside that extend to its full height. It is of more recent construction, and its use is not known.

In addition to its deteriorated state, the arsenic plant poses an extreme health threat because the building materials have been impregnated with arsenic through years of use.

Figure 150. A) Arsenic plant (structure #59)
B) Cyanide vats (structure #61)
C) Assay office (structure #58)
D) Electric substation (structure #54)
E) Revenue Mill (Structure #34)
(north view)

Figure 151. A) Arsenic plant (structure #59)
B) Assay office (structure #58)
(northwest view)

Figure 152. Arsenic plant (structure #59), northwest view.

Figure 153. Arsenic plant (structure #59) showing opening in stone foundation made for equipment entrance during clean-up of hazardous wastes, north view.

Figure 154. Interior of Arsenic plant (structure #59) showing detail of stone foundation wall, south end of eastern-most wall.

Figure 155. Arsenic plant (structure #59) showing the area containing the McDougall roasting furnace, south view.

Figure 156. Arsenic plant (structure #56) showing detail of belt lift adjacent to the McDougall roasting furnace, north view.

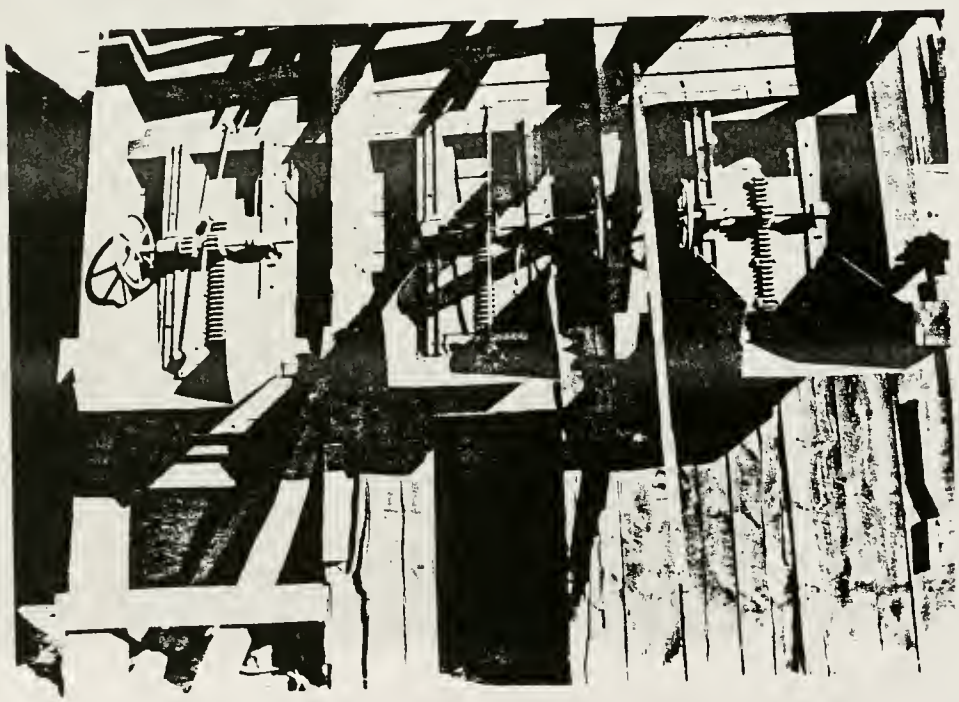

Figure 157. Arsenic plant (structure #59) showing detail of chutes on bins adjacent to McDougall roasting furnace, east view.

Figure 158. Arsenic plant (structure #59) showing area containing McDougall roasting furnace (arrow) and discharge gates (arrow) for emptying the primary kitchen along right, north view.

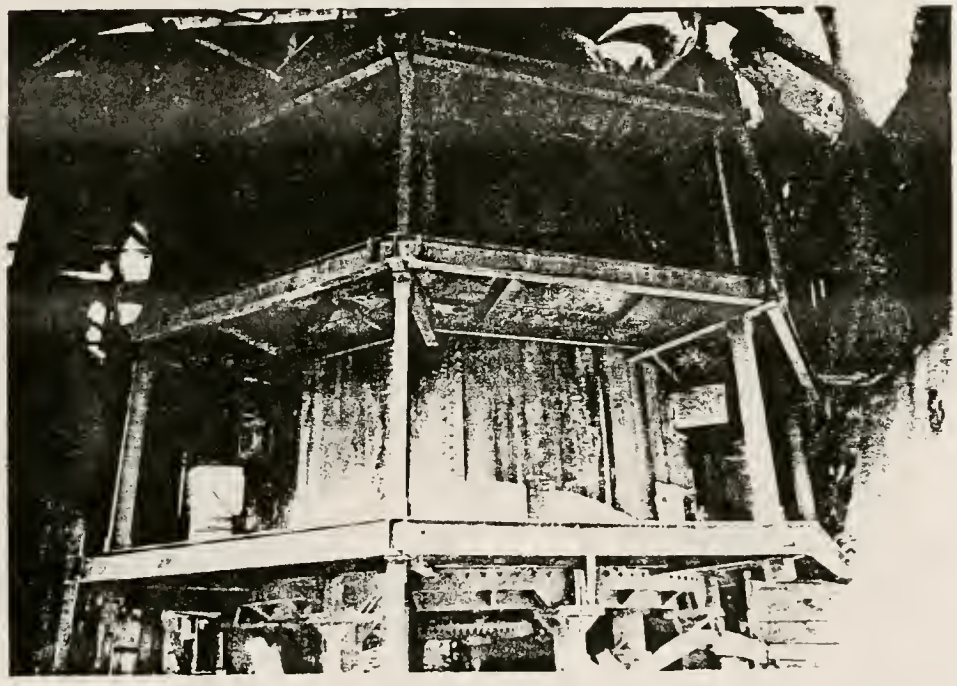

Figure 159. Arsenic plant (structure #59) showing McDougall roasting furnace, north view.

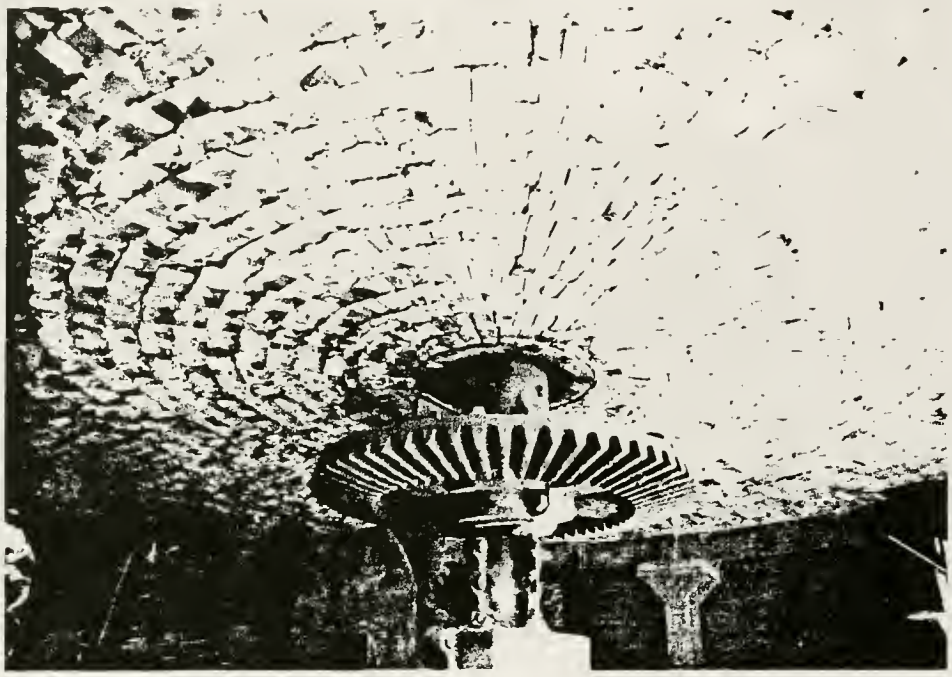

Figure 160. Arsenic plant (structure #59) showing detail of brick floor at the bottom of the McDougall roaster.

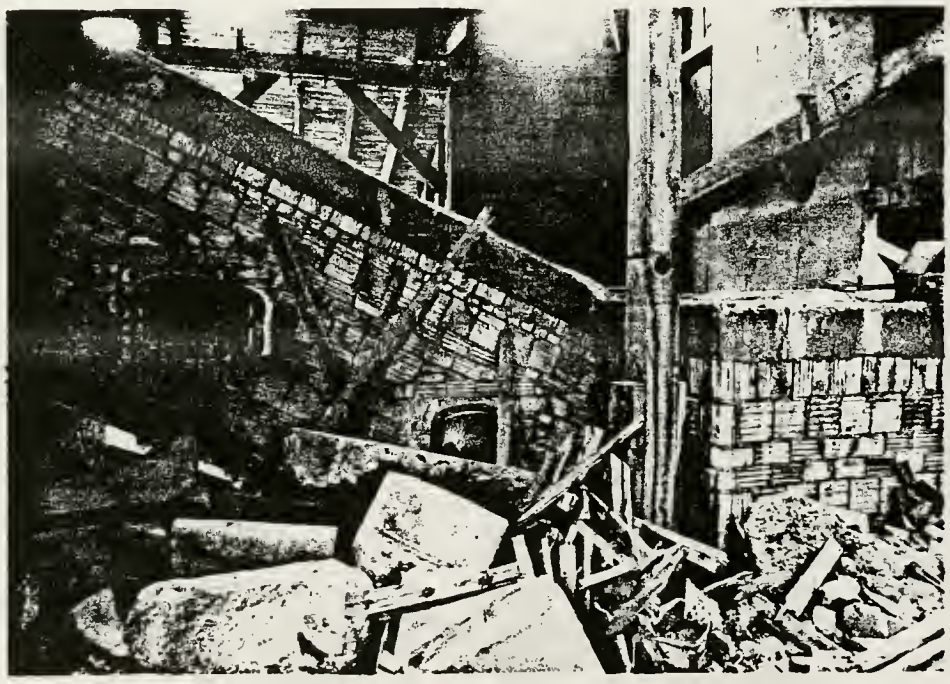

Figure 161. Arsenic plant (structure #59) showing detail of the flue entering the primary kitchen, west view.

Figure 162. Arsenic plant (structure #59). Detail showing the interior of the primary kitchen looking north. Discharge gates to empty the kitchen are lower left. Baffle plates are overhead.

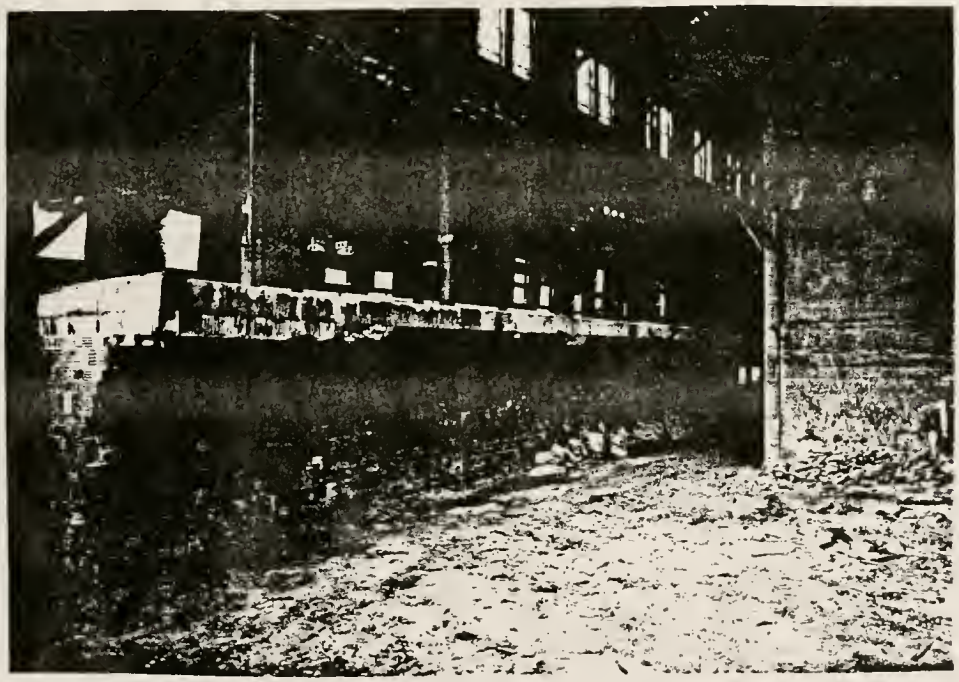

Figure 163. Arsenic plant (structure #59). Interior view showing the east wall of the primary kitchen and the remains of the secondary kitchen which ran parallel to it. At right is the newer concrete tower.

Figure 164. Arsenic plant (structure #59). Interior view showing holes knocked into the concrete tower during the salvage effort. Remains of the secondary kitchen at the left.

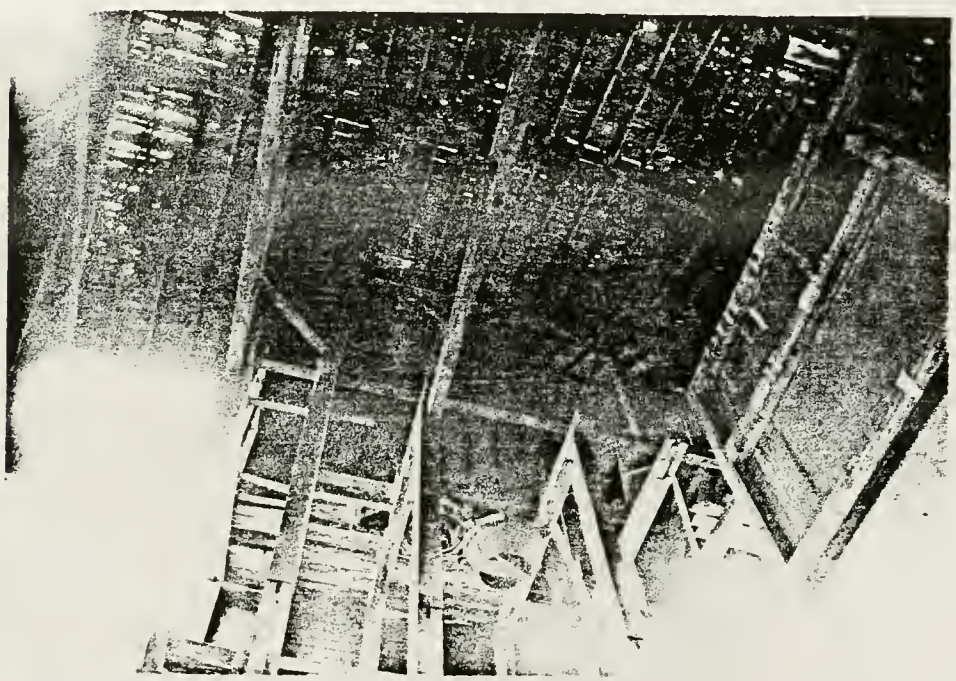

Figure 165. Arsenic plant (structure #59). Interior view of the roof trusses and the flue which carried gasses out of the plant to the hillside stack.

Figure 166. Arsenic plant (structure #59) showing rectangular opening through which gasses passed from the plant to the hillside stack, southwest view.

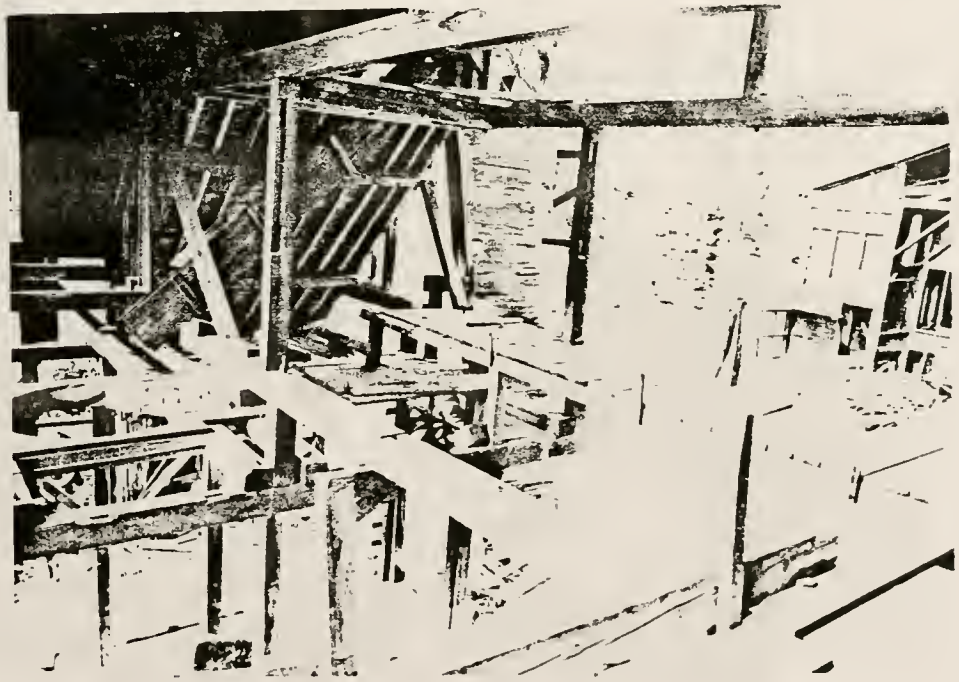

Figure 167. Arsenic plant (structure #59) interior view showing post and beam construction in the area at southwest corner of the plant.

Figure 168. Arsenic plant (structure #59) showing remains of the refining furnace (structure #60-arrow), northeast view.

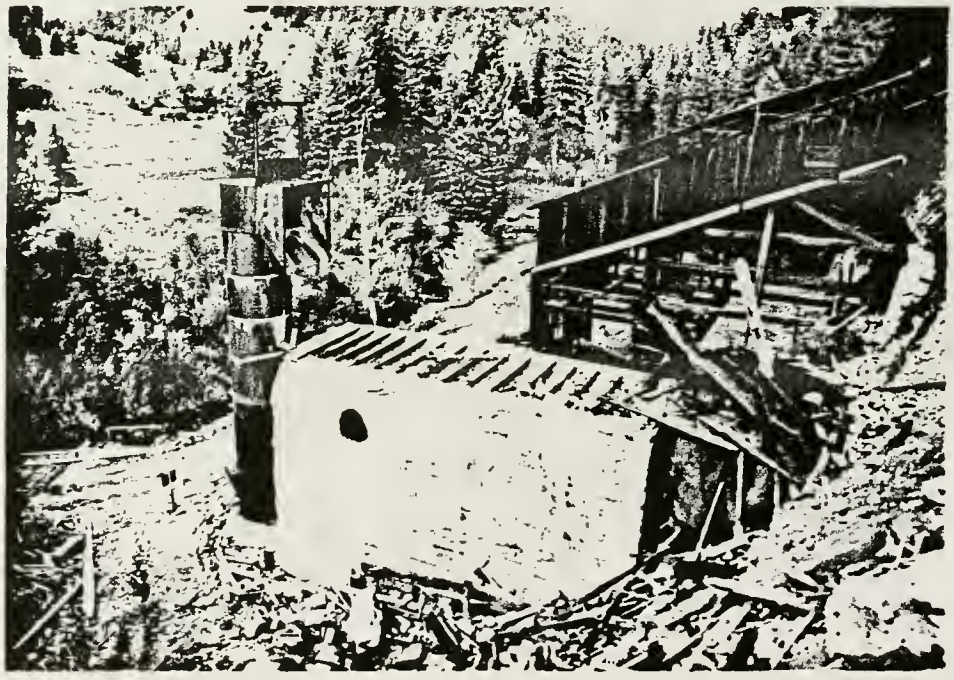

Figure 169. Refining furnace (structure #60), north view.

Figure 170. Arsenic plant (structure #59) looking north amidst the ruins of the cyanide plant.

Figure 171. Arsenic plant (structure #59) showing discharge gates for emptying the primary kitchen, east view.

Figure 172. Arsenic plant (structure #59), east view.

Figure 173. Arsenic plant (structure #59), east view.

Figure 174. Arsenic plant (structure #59), southeast view.

Figure 175. Small wood frame steam pipe shack, located north of Assay office (structure #58) and east of Arsenic plant (structure #59).

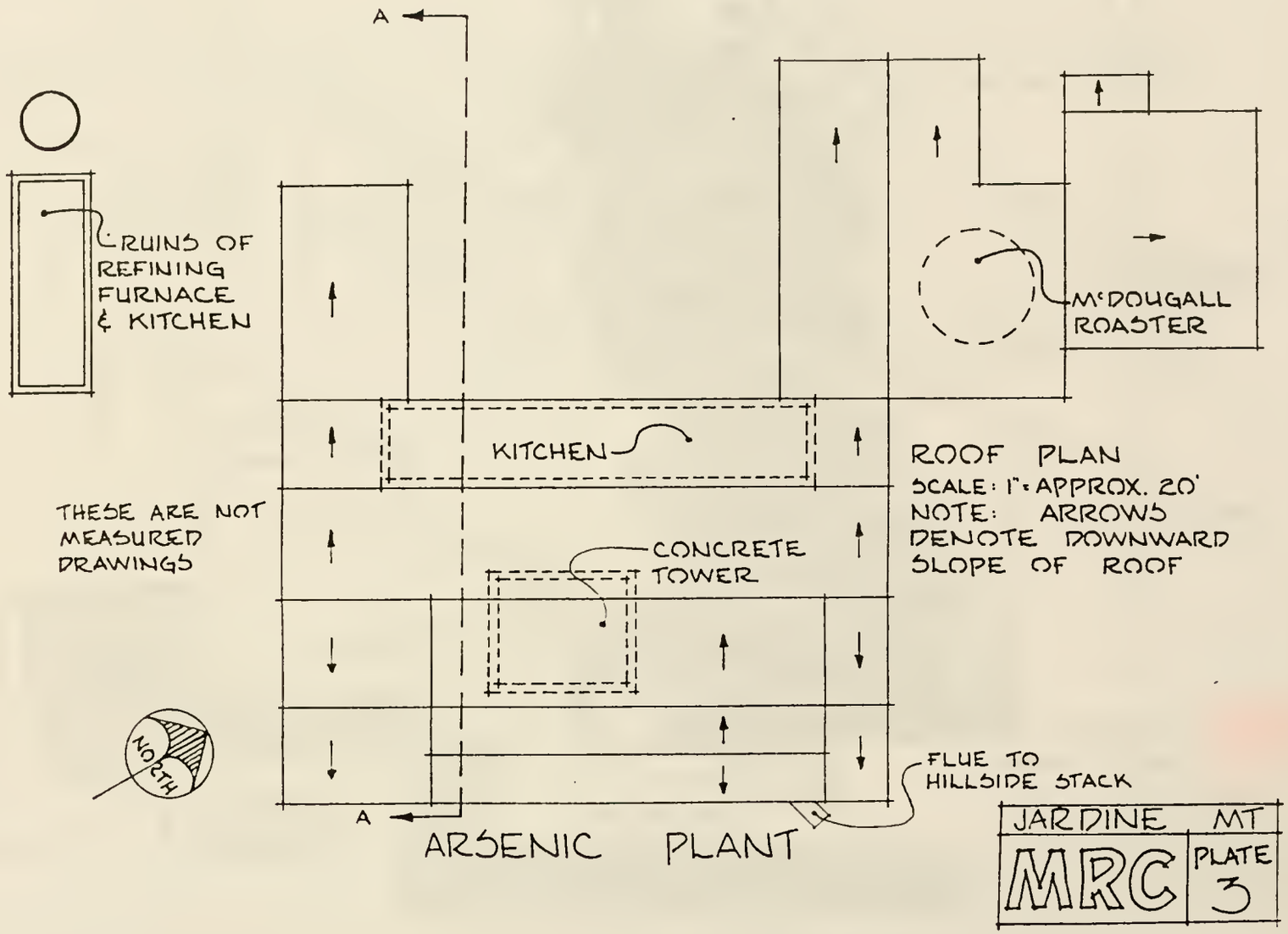

Figure 176. Arsenic mill (Structure # 59)
Architectural Plate # 3

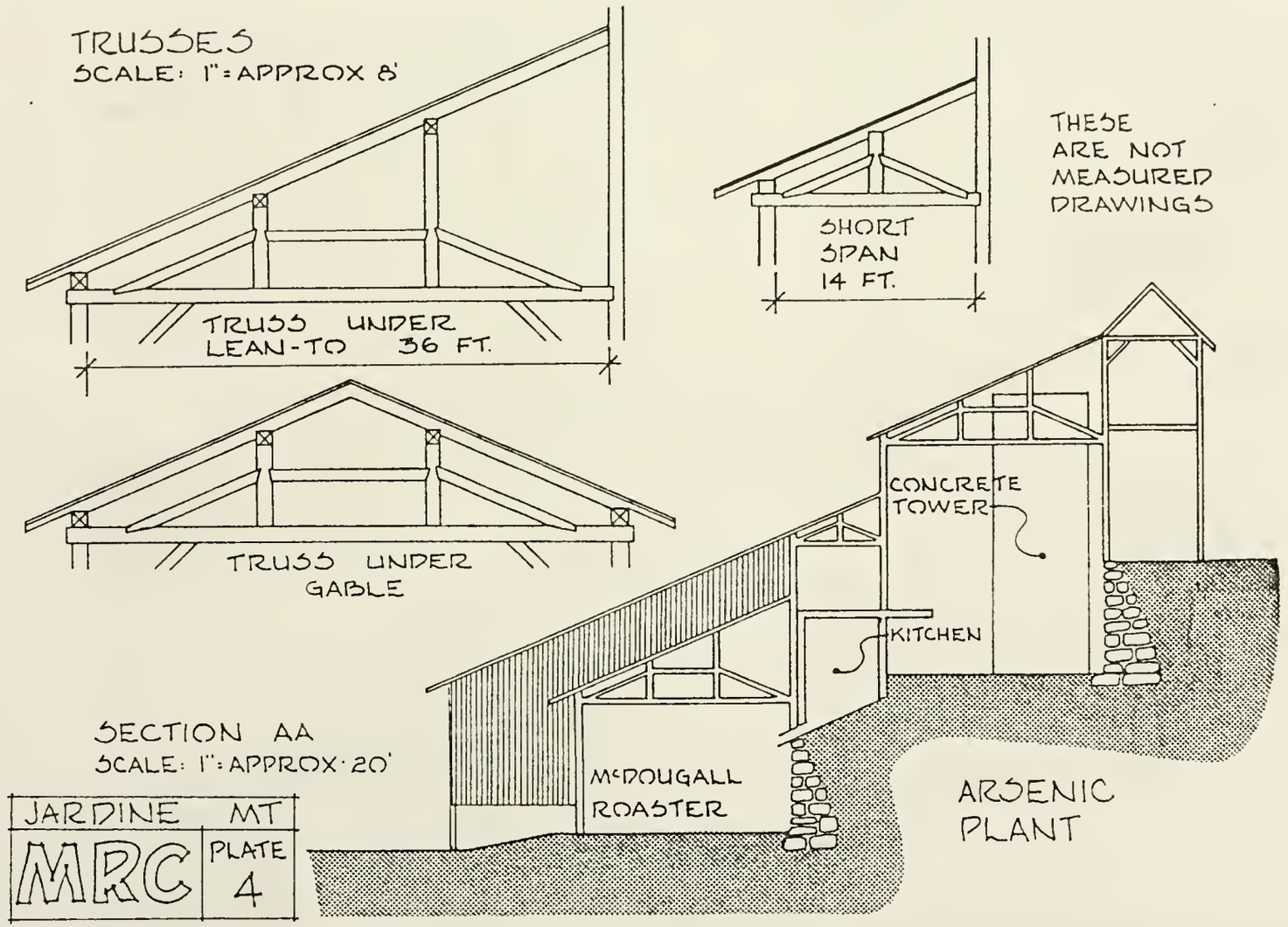

Figure 177. Arsenic mill (Structure # 59)
Architectural Plate # 4.

Structure #60 (seen in Figure 169) is the refining furnace that operated in conjunction with the Arsenic plant.

Structure #61 (Figure 178) consists of two charred circular cyanide vats, the only intact structural remains of the Cyanide Plant (seen in Figure 42-43) which burned in 1948. Although planned by the Bush companies, cyanide plant construction began in 1903 under jurisdiction of the Kimberly-Montana Company.[289] Equipment had already been ordered by the old Bear Gulch Mining Company reorganized under A. C. Jardine after Harry Bush left. The structure was originally built as an additional 40 stamp mill. The plant was completed by 1908 when several hundred tons of scheelite (calcium tungstate) concentrates were shipped.[290] Demand for tungsten began in 1898 when it was discovered that tungsten in steel allowed it to be used in high-speed cutting tools.[291] The Jardine plant produced tungsten concentrates intermittently until the 1940s, during which time it was the only Montana producer.[292] The cyanide mill was a critical part of the Jardine operations until it burned in 1948. With the destruction of the cyanide mill, operations at Jardine ceased. The ruins include some concrete and stone foundations, some steel tanks, the wood vats and a great deal of rubble.

Figure 178. Cyanide vats (structure #61), all that remain intact of the cyanide mill which burned in 1948, north view.

Structure #62 (Figure 179) is a small wood frame garage, 8' x 22' x 9', covered with corrugated metal siding. It has a cupola on the roof.

Figure 179. Structure #62, northwest view.

After leaving structure #62 and walking south (Figure 180) one is in the residential section of Jardine and is now encountering buildings that served as housing for miners in Jardine.

Figure 180. A) Structure #64
B) Structure #65
C) Structure #67, Harry Bush guest house (south view)

Structure #63 (Figures 181-182) is an L-shaped house built in the typical Jardine log cabin technique. It is 33 feet along its south side and 34 feet along its east side. Corrugated sheet metal gable roofs cover both legs of the L. There are two brick chimneys along the south wall. The western chimney is the larger of the two, features some corbelling at its top, and serves a large triangular fireplace mass which has a fireplace for each of its two adjoining rooms. The south and west walls sit on a stone foundation. The rest of the house has no foundation and is settled badly. Additions to the house include a board and batten vestibule along the east side, a deteriorated light wood frame and polyethylene film greenhouse along the south side, and a wood deck overlooking Bear Gulch on the west.

The house is unoccupied and in fair condition to the south, in poor condition to the north where settlement has occurred.

This building was used as a ski resort chalet when Mr. Blankenship operated a small ski lift in Jardine in the 1970s. The building appears in the 1925 photograph of Jardine (Figure 42).

Figure 181. Structure #63, northwest view.

Figure 182. Structure #63, northeast view.

Structure #64 (Figures 183-185) is an L-shaped log structure which employs the typical Jardine log construction technique. The original portion of the house is a 17' x 25' gable roof cabin with a porch along its east or front end. To it was added a 13' x 15' gable roof room on the north side. Two shed roof board and batten additions were later added to the north side of the new room. The house has two brick chimneys, and wood shingle roof and gable ends. There is no foundation and the house suffers from severe perimeter settlement.

The house is unoccupied and in poor condition. It also appears in the 1925 photograph of Jardine (Figure 42).

Figure 183. Structure #64, west view.

Figure 184. Structure #64, east view.

Figure 185. Structure #64, southwest view.

Structure #65 (Figures 186-187) is an L-shaped wood frame house with two separate shed roof additions on the back or west side of the house. The house has no foundation and has settled badly. Each leg of the L has a gable roof and there is a brick chimney near the intersection of the two ridge lines. Each leg of the L has a porch running along its east side. The east, south, and west sides of the house are sided with wood shingles. The north side is of board and batten. There are numerous interior finishes, including beaded ceiling. The longest dimension of the stem of the L is about 40' and the base is about 24 feet long.

The house is unoccupied and in poor condition, primarily due to the perimeter settlement.

This building appears in the 1925 photograph of Jardine.

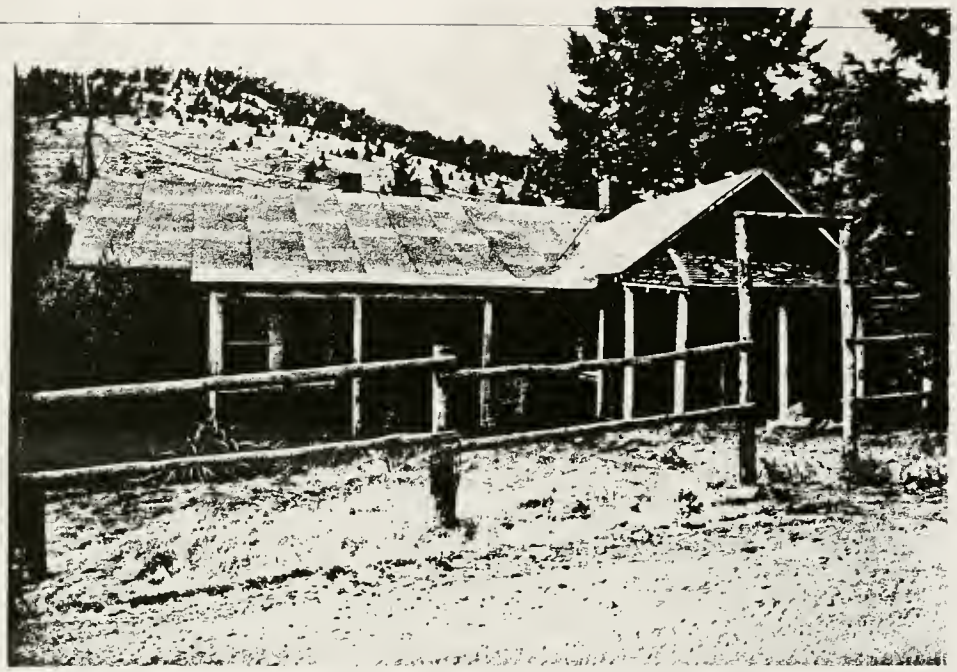

Figure 186. Structure #65, west view.

Figure 187. Structure #65, east view.

Structure #66 (Figure 188) is a rectangular shaped wood-frame garage measuring 15' x 23' x 9' with a wood shingle gable roof. The building is in poor condition. It probably dates to the 1920s.

Figure 188. Structure #66, west view.

Structure #67 (Figures 189-190) is the Harry Bush guesthouse constructed in 1898-1899. This building appears in the 1898 photograph of Jardine (Figure 11) and in an 1925 photograph (Figure 20).

It appears to have been virtually unchanged since it was built. The main body of the house is a 28' x 30' one-story, wood frame structure on a field stone foundation and with a hip roof. A 6-foot wide, hip roof porch runs the entire 30' length of the south (actually south southwest) or front facade of the house. A 10' x 12' room with a hip roof is centered along the back side of the house. There is a gabled dormer to the attic at the front of the house and the brick chimney is at the very center of the main body of the house. The wood lapped siding, the corrugated sheet metal roof, and the turnposts on the porch are the same as are found on the Mining Company Head quarters (Figure 189). The main difference in exterior detail between the two buildings is the grill under the eaves of the porch roof.

The interior of the Harry Bush guesthouse clearly reveals that it was built as a guest house. From the front door, a double-loaded corridor runs to the room off the back of the house. There are two bedrooms off each side of the corridor. There are two closets, one for each bedroom, between each pair of bedrooms. In later years, to make the house more suitable as a single-family dwelling, the wall between the corridor and the southeast bedroom has been removed and a door was cut through a closet to connect that room to the one in the northeast corner. Some other minor wall finish and closet modifications have also been made. However, most of the original window and door casings are still in place.

Towards the back end of the corridor is a hatch to the attic. The brick chimney is centered in the attic and therefore is centered directly over the corridor. Near the ceiling, the chimney mass spreads to either side of the corridor and then down through the space between the closets and the corridor, thus providing access to the chimney for stoves in each of the major rooms. Windows for these rooms are on the front and back facades only. The window on each of the sides lights the closets only.

Figure 189. Harry Bush guesthouse (structure #67), northeast view.

Structure #68 is a modern mobile home.

Structure #69 (Figure 191) is a stone fireplace currently used as an outdoor barbecue. However, it was once part of a house. The line where the roof met the chimney is still evident. The worn cobble stones used in this fireplace and chimney are unusual for those extant in Jardine.

Structure #70 (Figures 192-193) is a log bunkhouse measuring about 18' x 26' x 8' and constructed of square hewn logs with dovetail joints. To this log building have been added, at various stages, several wood frame additions. The log building has a gable roof and the gable roof of the additions have all been tied together in an ungainly fashion. The large 30' addition extending to the west contains ore samples. The rest of the building is unused. The building, which has no foundation is in fair condition. This building appears in the 1925 photograph of Jardine (Figure 42).

Structure #71 (Figures 194-195) is a house located on the flood plain of Bear Creek. It is actually comprised of two log cabins connected by a small room. Each of the cabins use the Jardine log construction technique which has a plank joinery rather than some form of notching at the corners. These cabins appear to have been moved.

Structure #72 is a timber stringer bridge built in 1938 to replace an earlier timber Howe truss bridge which had been constructed in 1899.

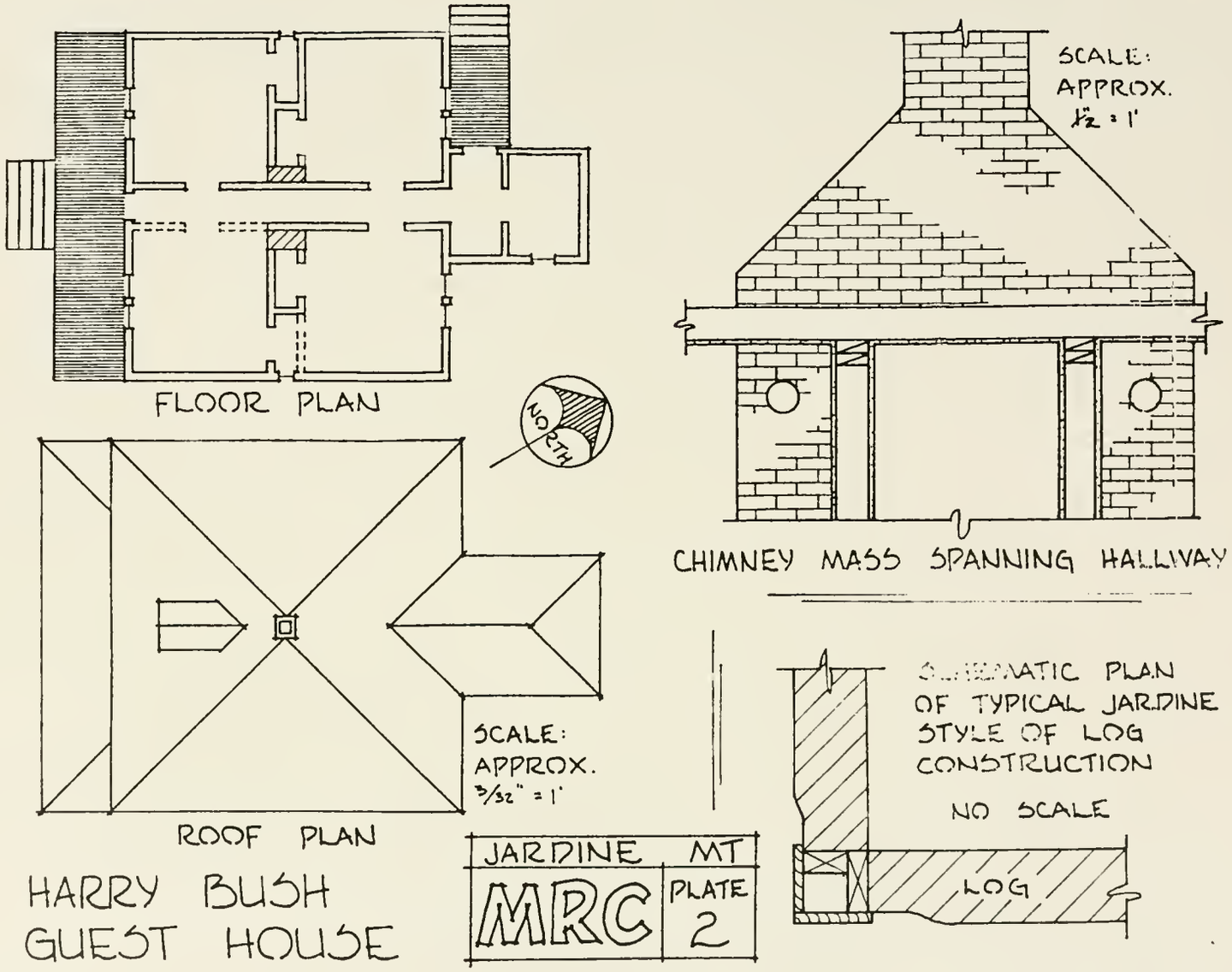

Figure 190. Harry Bush guesthouse (Structure #67)
Architectural Plate # 2.

Figure 191. Structure #69, northwest view.

Figure 192. Structure #70, northeast view.
A) original log building
B) addition

Figure 193. Structure #70, west view.
A) original log building
B) addition

Figure 194. Structure #71, east view.

Figure 195. Structure #71, west view.

Structure #73 (Figures 196-198) is the mining company headquarters building which was constructed in 1899 and has functioned as an office for every mining company that has operated in Jardine. The building can be seen in photograph taken in Jardine in 1899 (Figure 11) and in 1925 (Figure 42). The original portion of the headquarters is a 28' x 36' building sitting on a field stone foundation. A hip roof porch runs along the full 28' of the west or front facade of the building. The stone perimeter foundation is supplemented by a stone foundation wall at mid-span running both north-south and east-west. A massive stone foundation supports the chimney mass at the intersection of these two supplemental walls (Figure 196).

The main body of the headquarters is 22' x 28' two story building with the ridge of its gable roof running north-south (actually NNE-SSW). There is also a 14' x 28' one story portion along the east side of the main body of the headquarters. This portion has its ridge-line running east-west and in the center of the ridge has a lantern which allows light into the interior of the building. Since 1925 a second addition, 18' x 18', has been added to the north end of the east side. Wood siding on all portions of the building are the same.

Much of the interior finish of the headquarters is very old, if not original. The walls of the two front rooms on the first floor, the very steep stairs, and the entire second floor are finished with beaded ceiling board. The two back rooms comprising the one story portion are finished in homosote. The room of the addition has recently been refinished in sheetrock. In the original section of the building, floor-to-ceiling height on the first floor is 9 feet. The second floor has an 8 foot ceiling with knee walls rising 5'8" before meeting the slope of the roof. The brick chimney stack sits diagonally in the house, serving all rooms but that in the addition. One-over-one double hung sash appear to be original and have recently been retrofitted with wood sash storm windows.

The Mining Company Headquarters is in good condition, having been occupied almost continuously over the years.

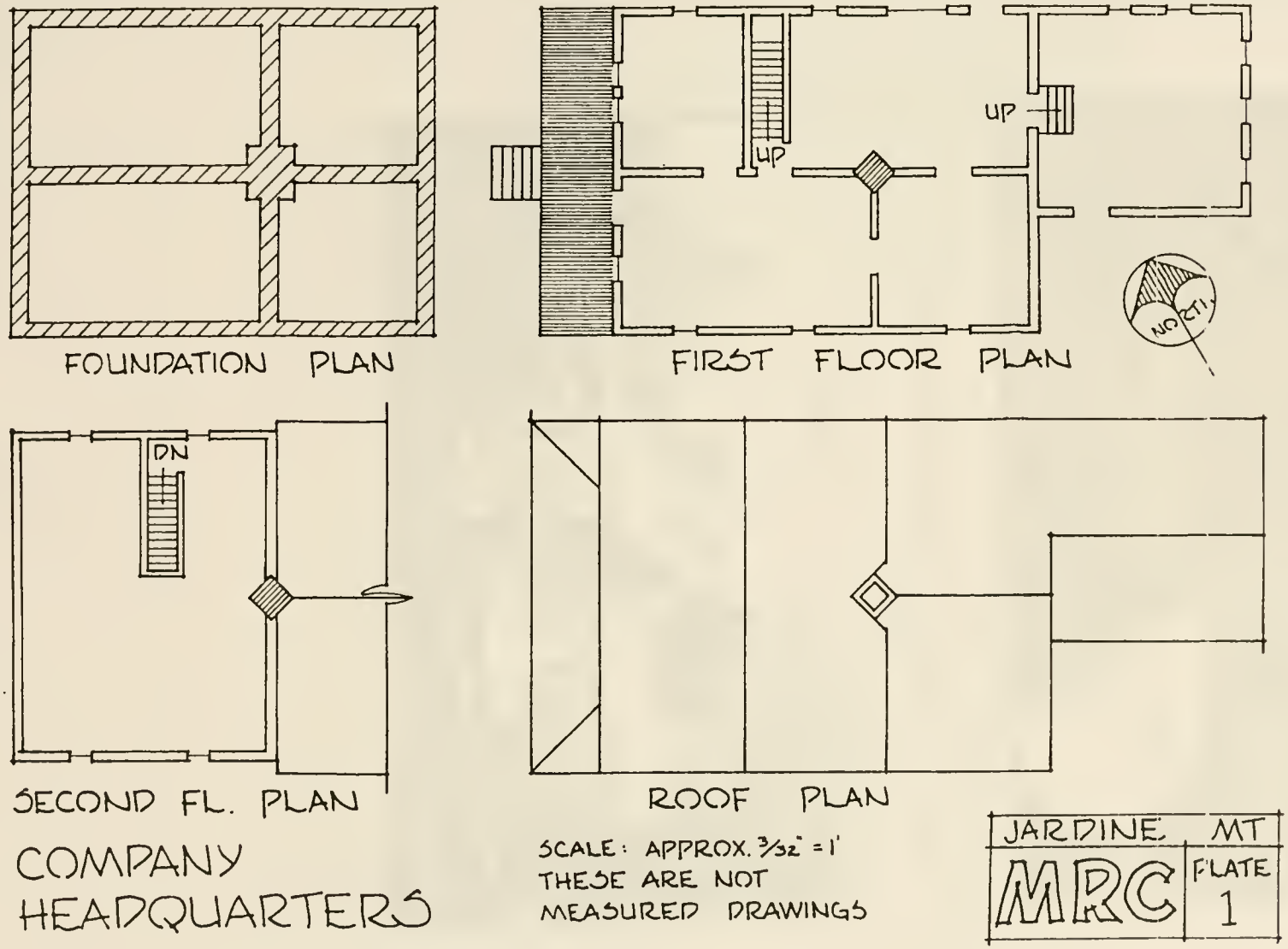

Figure 196. Mine company headquarters (Structure # 73)
Architectural Plate # 1.

Figure 197. Mine company headquarters (structure #73), east view.

Figure 198. Mine company headquarters (structure #73).

Figure 199 shows a view looking north up the main street of Jardine.

Figure 199. A) Structure #96
B) Structure #91
C) Structure #101
D) Structure #100
E) Structure #99
F) Structure #83
G) Structure #73 (mine company headquarters)
H) Structure #81
I) Structure #78
J) Structure #34 (Revenue Mill)

Structures #74, #75, #76 and #77 are modern houses.

Structure #78 (Figure 200) is an older 1-1/2 story wood frame house that is in the process of being extensively modernized and remodeled.

Figure 200. Structure #78, north view.

Structure #79 (Figures 201-203) is the Jardine school house which was constructed in 1898-1899 and appears in the 1899 and 1925 photographs of Jardine (Figures 11, 42). It is a 20' X 36' wood frame structure with the ridge line of the gable roof running north-south (actually NNE-SSW). The building sits on wood blocks and has settled to the west. The school house has wood shingles on the roof and the wood siding is similar to that used on the Mine company headquarters building (Structure #73) and the Harry Bush guest house (Structure #67). There is a brick chimney stack at the center of the building. This chimney stack was moved at a later time to the center of the ridge line. The interior of the school now used for storage by Mr. Blankenship is finished in a beaded ceiling. The school house is in good condition.

Figure 201. Jardine school house (Structure #79), east view.

Figure 202. Jardine school house (Structure #79), north view.

Figure 203. Jardine school house (Structure #79). Photograph ca. 1910-1920, Courtesy of Bill and Doris Whithorn. Park County Museum, Livingston, Montana.

Structure #80 is a remodeled old wood frame home that is the residence of Mr. Blankenship and his wife.

Structure #81 is a fairly recent asphalt "brick" sided shack that has been moved. It can be seen in Figure 199.

Structure #82 (Figure 204) and Structure #83 (Figure 205) are two mine company houses that do not appear in the 1925 photograph but probably were built shortly thereafter. In their original form, they were identical, being of a modest bungalo style. Each house is one story on a concrete foundation, about 20' X 25', with a gable roof with wood shingles. Each house has clapboard siding and a bungalo style porch on its west (front) facade. There are two brick chimneys at the ridge line of each house. The northern house has a small gable roof addition on the rear and the southern house has a shed roof addition on the rear. The interior of each house consists of four rooms and a bath. There is a small shed behind each house.

Figure 204. Structure #82, east view.

Figure 205. Structure #83, east view.

Structures #84, #85, and #86 are modern house trailers used by the Homestake Mining Company personnel.

There are a number of buildings at the south end of Jardine which are of little architectural significance, but which are quite old and which contribute to the overall collection of historic buildings in Jardine.

Structure #87 (Figure 206) is a log garage which measurers 18' X 21', has a gable roof and which was built using typical Jardine log joinery construction. A three foot frame lean-to addition has been added on the south side to allow the garage to accomodate longer modern vehicles. It is in fair condition.

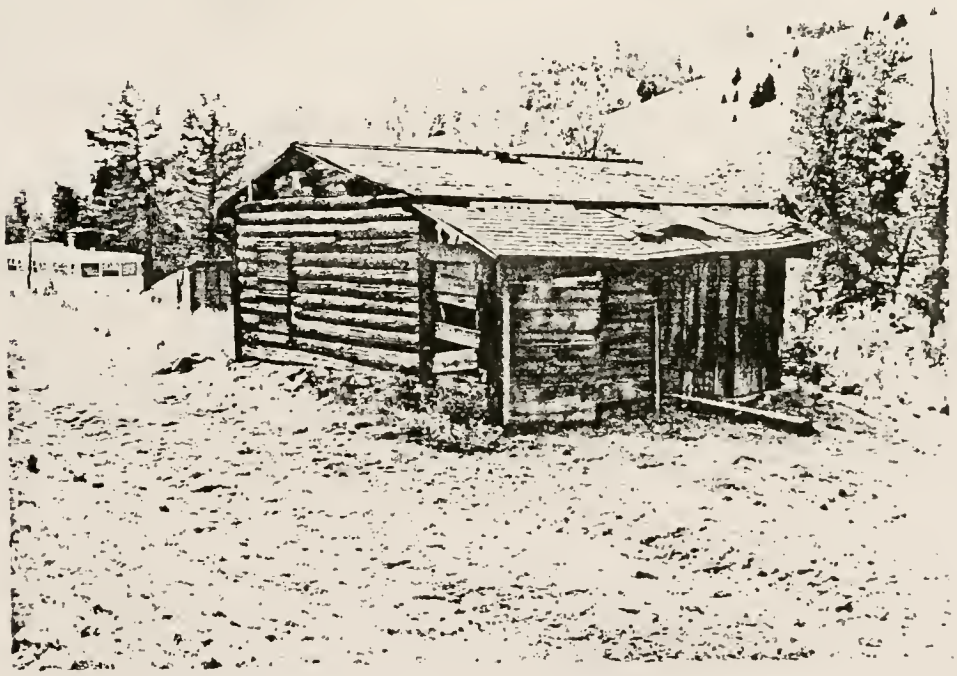

Figure 206. Structure #87, southeast view.

Structure #88 (Figure 207) is a barn which is two-thirds log (west) and one-third wood frame (east). The entire south side, the east end and the east third of the north side are sheathed in corrugated sheet metal. The rest is exposed log construction that utilizes the typical Jardine log joinery style. The roof slopes down to the south, with the north eaves of the middle third being set back from the others. The roof of the west third is higher than the rest of the roof. Yet the wall between the west and middle thirds does not coincide with the separation between the roofs. There are stalls in the west third with a high loft above. The rest of the barn is hay storage. The barn is in fair condition.

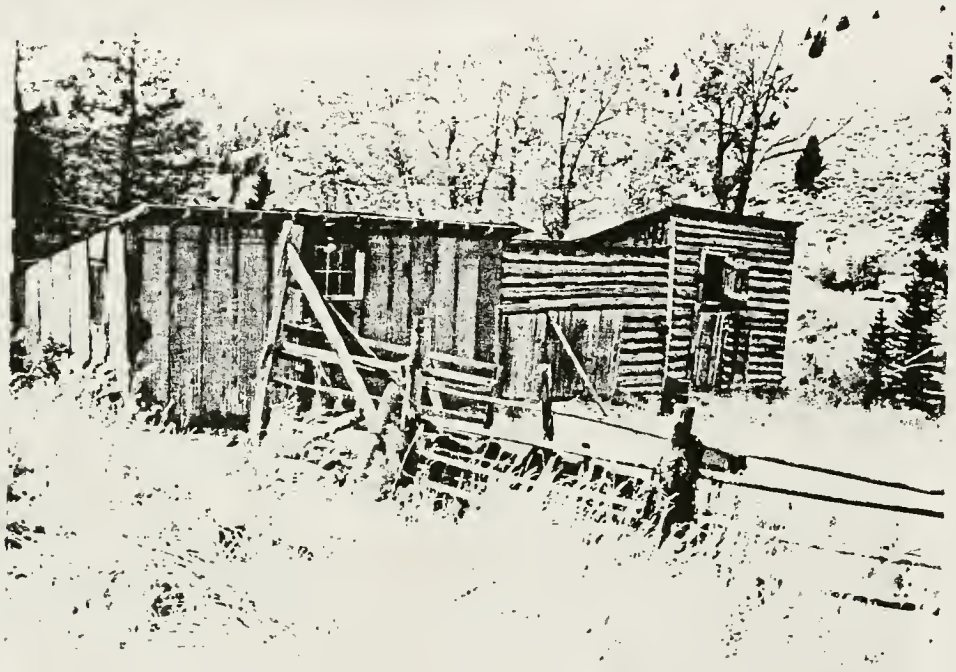

Figure 207. Structure #88, southwest view.

Structure #89 (Figure 208) is a small log cabin that is now used as a small barn. The corner logs are joined in v-notches and saddle-notches. The logs are all round and the building measures 8' X 19'. It is in poor condition. This is one of the older structures in town. It now has a corrugated sheet metal roof.

Figure 208. Structure #89, west view.

Structure #90 (Figure 209) is a wood frame board and batten shop which is visible in the 1899 (Figure 11) and 1925 (Figure 42) photographs of Jardine. The main body of the shop is 18' X 27' and has a gable roof with wood plank roofing material. A 10' X 27' lean-to roof shed is attached along the north side of the shop. It is in fair condition.

Figure 209. Structure #90, northwest view.

Structure #91 (Figure 210) is a large storage structure comprised of an old wood frame tar paper building with a long pole shed adjoining the west side. The old building is 27' X 40' and the shed is 20' X 90'. The old building is used for drill core storage. It may be visible in the 1925 photograph of Jardine (Figure 42). According to Mr. Blankenship it originally was a miners bunkhouse.[293]

Figure 210. Structure #91, west view.

Structure #92 (Figure 211) is a log garage that measures 12' X 21' with a small wood frame (5' X 12') addition of the west end. It has a wooden gable roof and the corner joints are the typical Jardine style. It is in fair condition.

Figure 211. Structure #92, northwest view.

Structure #93 (Figure 212) is a log cabin that has been converted into use as a barn. The original cabin exhibits typical Jardine style of log construction and measures 12' X 12'. A small wood frame addition (4' X 8') is on the east side. It is in fair condition.

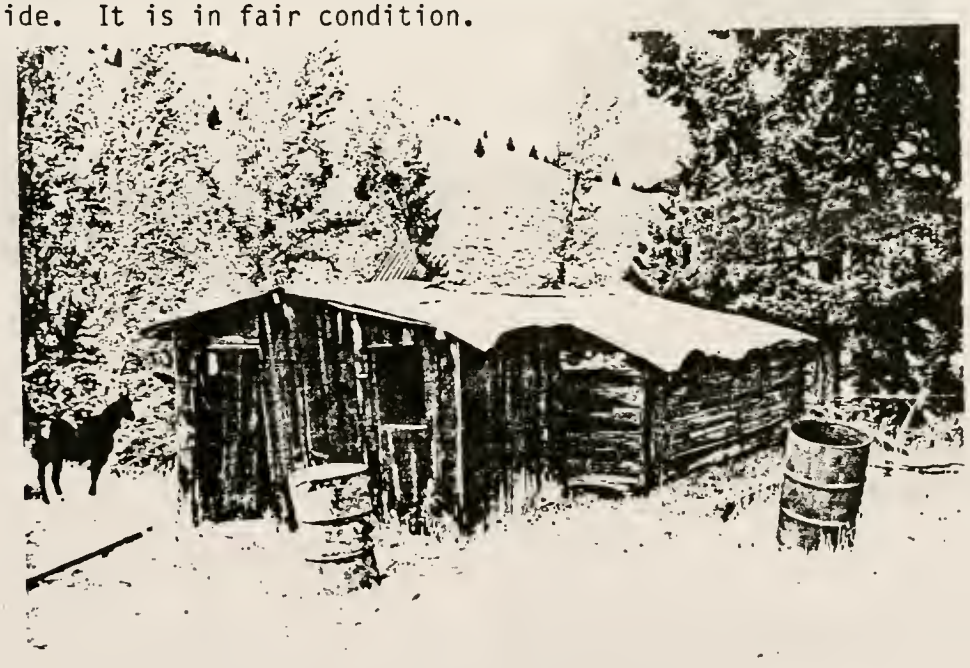

Figure 212. Structure #93, west view.

Structure #94 (Figure 213-214) is a wood frame gable roof board and batten barn measuring 12' X 28' that utilizes post and beam construction. There is a lean-to shack (7' X 7') attached to the south end. It is in fair condition.

Figure 213. Structure #94, southeast view.

Figure 214. Structure #94, northwest view showing lean-to addition, several small shacks and chicken coup.

Structure #95 (Figure 215) is a wood frame tar paper house on a rubble foundation. It uses stud frame construction, has three rooms in a T-shaped plan and has a gable roof. It is in poor condition.

Figure 215. Structure #95, southwest view.

Structure #96 (Figure 216) is a log house (12' X 27') with a gable roof built with alternating lapped corner joints. It has a wood frame entry way porch on the east side. It has a brick chimney with a slightly corbeled collar near the top. This cabin is privately owned and is in good condition.

Figure 216. Structure #96, northwest view.

Structure #97 is a modern house trailer.

Structure #98 (Figure 217) is a wood frame garage (8' X 15') with a gable roof. It has a wood plank roof and vertical wood plank siding. It has a double door that opens out. It is in poor condition.

Figure 217. Structure #98, northeast view.

Structures #99 and #101 are modern wood frame buildings.

Structure #100 (Figure 218) is a rectangular wood frame tar paper building with a gable roof oriented north-south. It has a double door on the west side which opens out and has two windows on the west side. It is used as a shop by the Homestake Mining Company. It is in good condition.

Figure 218. Structure #100, east view.

Structure #102 (Figure 219) is a 12' X 20' log cabin with a gable roof and the typical Jardine joinery style. There is a wood frame lean-to garage on the north side. It is in excellent condition.

Figure 219. Structure #102, east view.

Structure #103 (Figure 220-222) is the Welcome-Bacorn-Foster house. It is presently occupied by Mrs. Foster, daughter of Harry C. Bacorn, a mining engineer previously involved with the Golden Sunlight Mine near Whitehall who, in 1917, became manager of the newly organized Jardine Gold Mining and Milling Company.[294] Bacorn remained involved with the Jardine Mining Company until his retirement in 1936.[295] This house was built by George Welcome, prominent early businessman and miner in Bear Gulch probably around 1900. Welcome arrived in Montana in 1880 from Minnesota. He was a contractor for the Northern Pacific Railroad when he came to Livingston. Leaving the railroad he moved to Gardiner, then to Horr where he established a hotel in Aldridge. Arriving in Bear Gulch in the late 1890's he became associated with Harry Bush and the Bear Gulch Mercantile and Land Company. Welcome operated a hotel and general merchandise store in Bear Gulch. He died in 1905 and is buried in the Jardine cemetery. Harry Bacorn lived in the house in the 1920's and 1930's. This house is the largest older house in Jardine and the most substantial. The main body of the house is about 20' X 55' with a 7' X 25' leg off the south end of the west side and a 20' X 20' leg of the north end of the east side. Gable roofs cover each of these portions of the house. The house is a one story wood frame with lapped siding on a stone foundation. It has an enclosed porch that runs the entire length of the west side of the building. This porch originally was open. The house has the same type of porch posts as the mine company office (Structure #73) and the Bush guest house (Structure #67). There are several small lean-to sheds along the east side of the house.

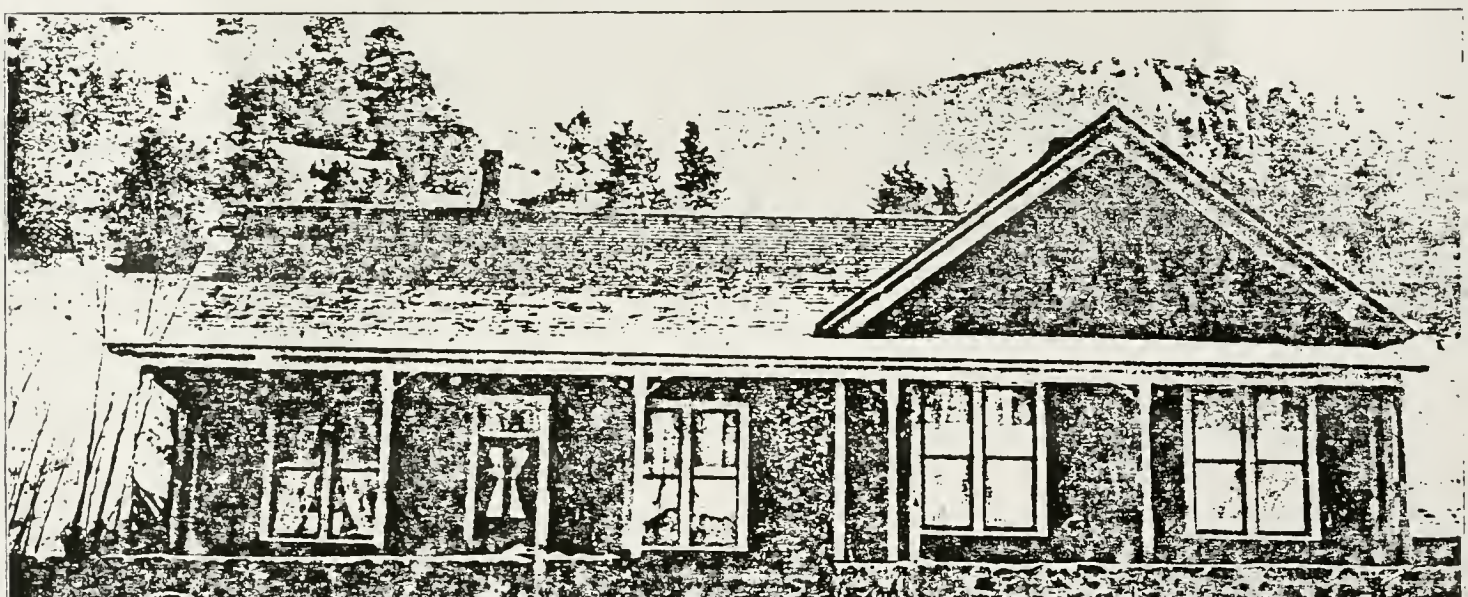

Figure 220. Welcome-Bacorn-Foster house (Structure #103) ca. 1900 (From Livingston Enterprise Souvenir, Park County Museum, March 17, 1900, p. 10)

Figure 221. Welcome-Bacorn-Foster house (Structure #103) east view, 1981.

Figure 222. Welcome-Bacorn-Foster house (Structure #103), north view, 1981.

Feature #104 (Figure 223) is the remains of an old tailings pond (75' X 300') that was probably associated with the old stamp mill erected by Major Eaton in 1884 and later added to and operated by first Edgerton and Jewell and secondly, Harry Bush and the Bear Gulch Mining Company.

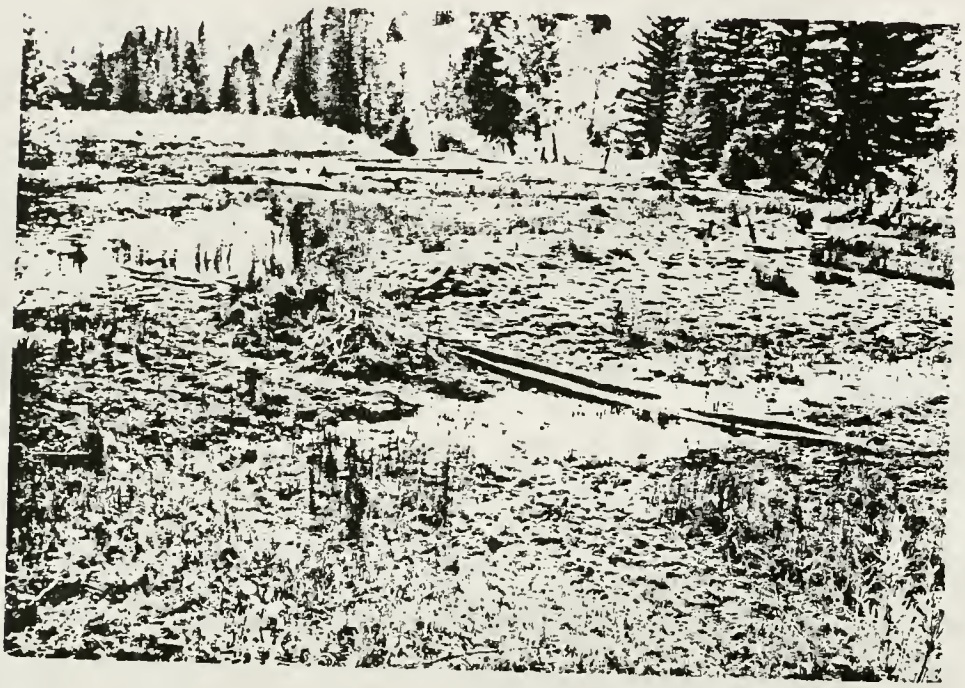

Figure 223. Tailings pond (Feature #104), south view.

Feature #105 is a large tailings pond (200' X 1500') located 1/2 mile south of town it is believed that these are tailings primarily derived from ores milled by the Jardine Mining Company in the 1920's and 1930's.

Proceeding south of town approximately 1/2 mile, the road makes an abrupt turn north and heads up Mineral Hill. The remaining features and structures to be discussed are historical mining ones located at various places on the west side of Mineral Hill.

The major ore production of the Jardine Mine came from these lode deposits on Mineral Hill. The Jardine Mine refers to all of the mining operations on the steep western slope of Mineral Hill where a vein system has been developed by open cuts and adit workings of which there are nearly 35 in number. It is reported that underground workings total nearly six miles in length.[296] The Jardine Mine can be divided geologically into a north and south mine.[297] Two basic types of veins occur in the Jardine Mine, one being a quartz vein in quartz-biotite schist and the other being a sulphide vein associated with altered cummingtonite schist. Seager identifies the main veins in the following manner:

> The veins have been named or numbered in a manner which seemed appropriate at the time of mining. To the main veins as successively encountered by early adits into Mineral Hill, the names No. 1 vein, No. 2 vein, No. 3 vein, and No. 4 vein were applied respectively, the latter being eastermost. In recent years the practice has been to designate newly developed veins by drift numbers, such as 1056 vein, and this practice is gradually superseding the use of the older names throughout the mine. Hence, 1155 vein refers to No. 3 vein on the 1111 level.[298]

Figure 224 is a topographic map of Mineral Hill that shows most of the mine workings. Figure 225 shows the underground workings of the 1200' level of the Jardine Mine, while Figure 226 shows vertical sections through the Jardine Mine.

The No. 1 vein is a sulphide rich vein with many strands most visible in the western portion of the south mine and in the 601 and 701 open cuts. The most common type of rock is quartz-cummingtonite schist with its hydrothermally altered equivalents.[299] Arsenic, tungsten and gold occur in this vein zone. Gold values are not consistent and can be quite erratic. The No. 1 vein was the primary source of arsenic ore production in 1923-1926 and 1933-1936.[300] Arsenic values ranged from 2% (40 lbs./ton) to as high as 20% (400 lbs./ton), while gold values averaged around 0.25 ozs./ton.301 Tungsten is present in small amounts. Major development of the No. 1 vein was done by the Jardine Mining Company from 1920 on. This sulphide ore apparently was discarded by early miners in favor of siliceous and soft schist ore which carried more free-milling gold.[302]

The No. 1246 vein is a thin quartz vein that occurs 20 feet below the No. 1 vein.[303] It is visible in the south mine and has been a major producer of tungsten ore.

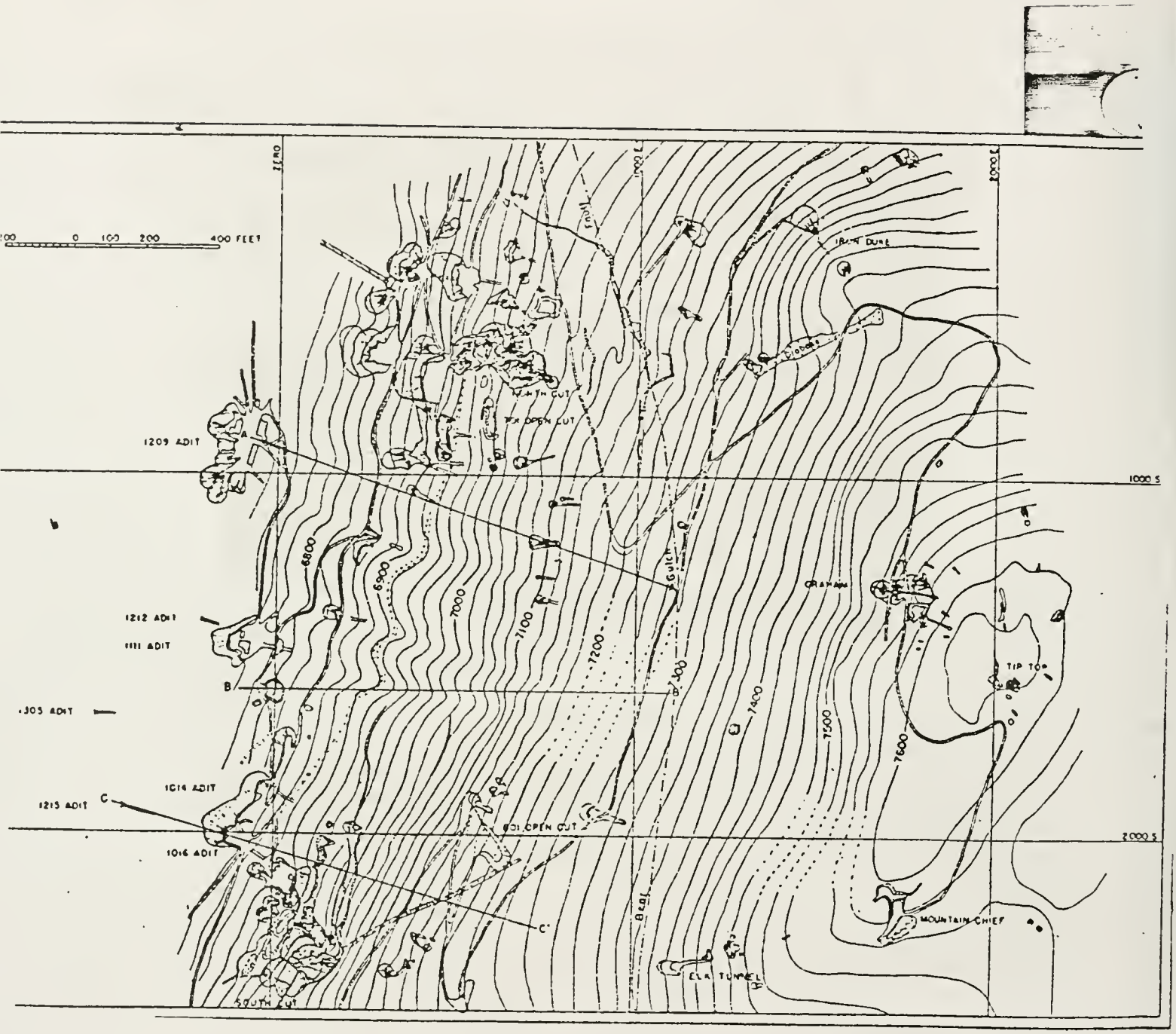

Figure 224. Topographic Map of Mineral Hill, Jardine, Montana. (Seager, 1944, p. 821.)

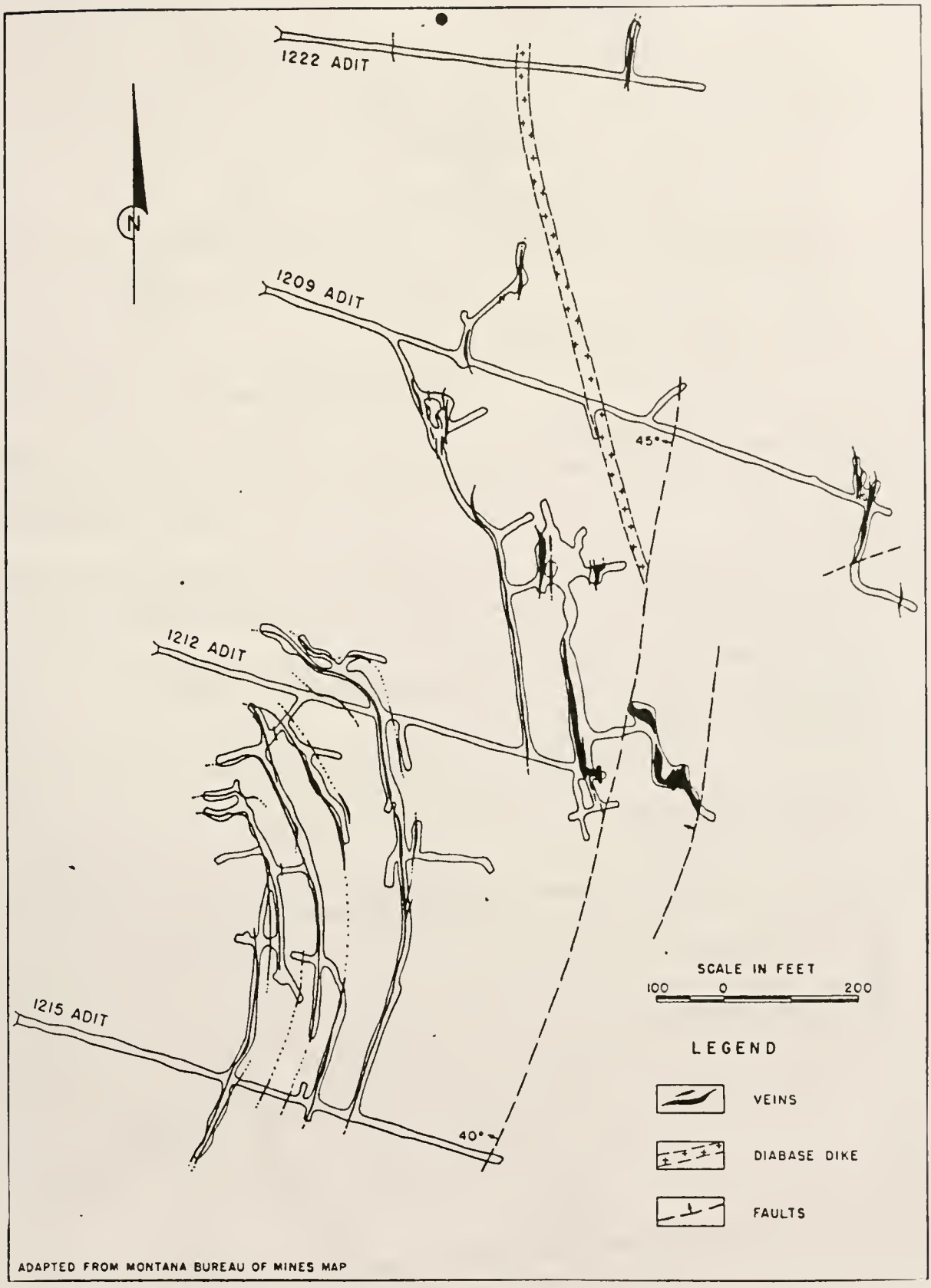

Figure 225. Underground workings, 1200' level, Jardine Mine (Reed, 1950, p. 28).

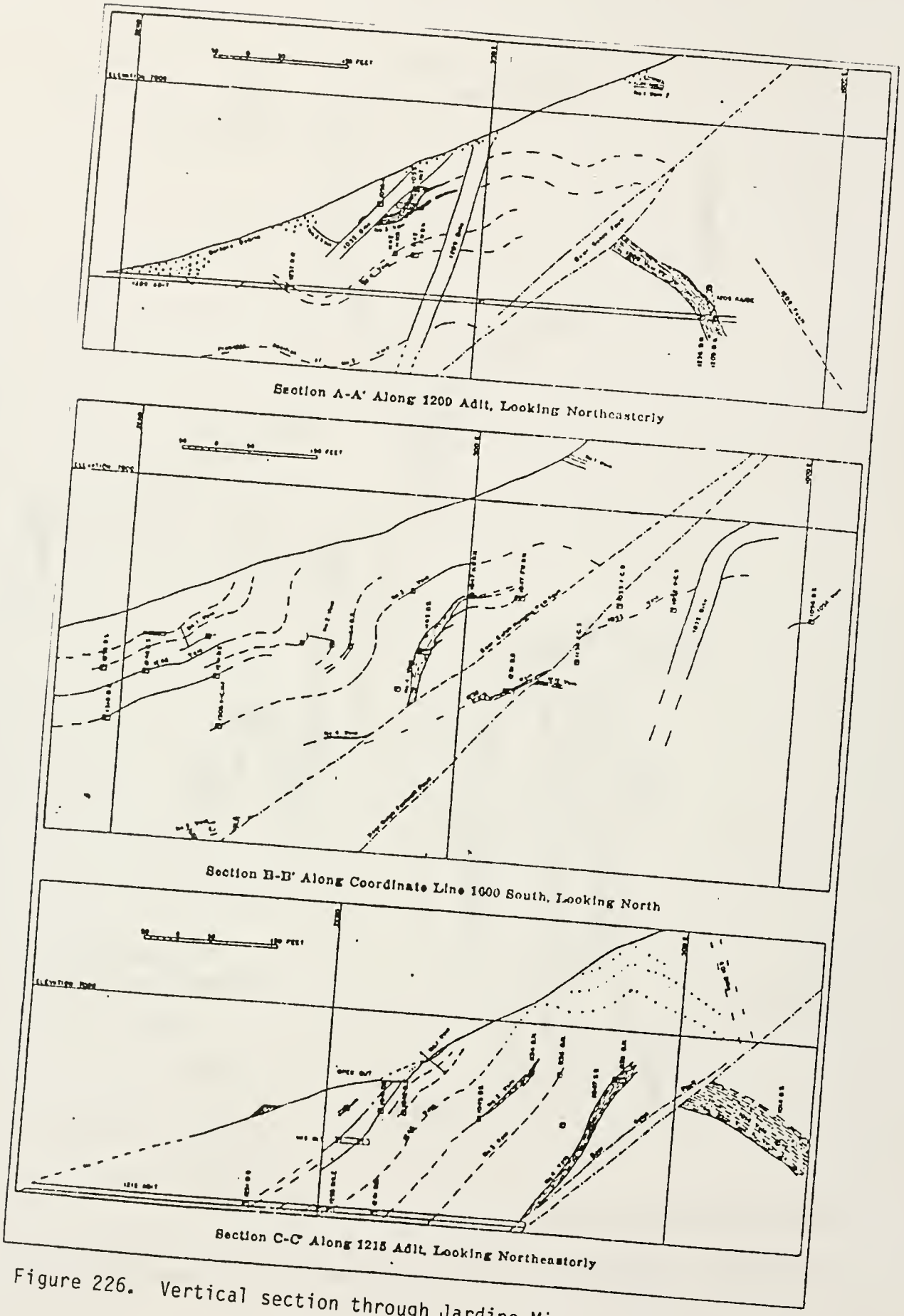

Figure 226. Vertical section through Jardine Mine. (Seager, 1944, p. 83)

The No. 2 vein lies east and approximately 35 feet below the 1246 vein and contains sulphides in schist and quartz pods.[304] This vein has been an important producer of gold ore and tungsten. This vein is encountered in the south cut, the 1016 adit, the 921 tunnel, the 1014 adit and the 1111 adit. [305] Average gold content is approximately 0.1502/ton.[306]

The No. 3 vein is a quartz lode enclosed by altered quartz-biotite schist and is located east of the No. 2 vein. [307] This vein has been extensively explored and developed. In 1904-1906, the Kimberly-Montana Gold Mining Company headed by "Cabbage" Ryan removed 400,000 lbs. of tungsten from this vein valued at $100,000. This vein also was a major producer of tungsten ore for the Jardine Mining Company in the 1930's.[308] This vein is exposed in the 910 and 1055 adits. [309] The largest single mass of schedite was encountered in this vein. [310] Gold content averaged around .20 ozs./ton.[311]

The No. 4 vein is a quartz vein located east of No. 3 vein and is exposed in the south mine, the No. 12 level and the No. 14 level. [312] Gold is erratic and averaged around .15 to .20 ozs./ton in this vein. [313] Tungsten and arsenic content is lower.

Another identified vein is the 1238 vein, is a quartz-sulphide replacement in cummingtonite schist, and lies within the Bear Gulch fault.[314] This vein was worked in the late 1930's in the No. 12 level.

Feature #106 is an open cut that was driven into Mineral Hill in a southeasterly direction. This was part of the south mine.

Feature #107 is a collapsed and caved timbered mine shaft that was part of the south mine complex. The timbering was square-set.

Features #108 and #109 are mine waste development dumps associated with the south mine.

Feature #110 (Figures 227-228) consists of a caved-in mine adit with a timbered portal, two waste development dumps and a small wood frame building. The building measures 10' X 15' and has a single window on the west side. It has a roof that slants east and is wood frame with horizontal board and batten siding. The interior was empty except for a few ore samples and a 50 gallon steel drum stove. The building has no foundation and is in good condition. The collapsed mine portal measuring approximately 4' X 6' was constructed using square set timbers. It is believed that the structures associated at this feature were built in the 1930's. This feature #110 was associated with the south mine.

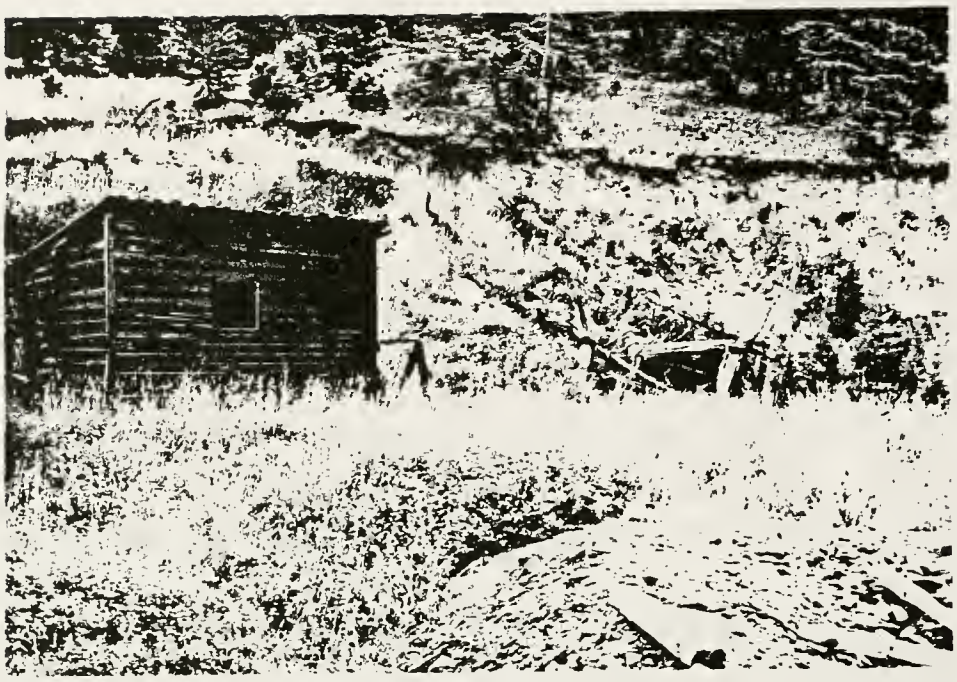

Figure 227. Feature #110 showing frame building on left, mine portal to the right and edge of dump in right foreground, east view.

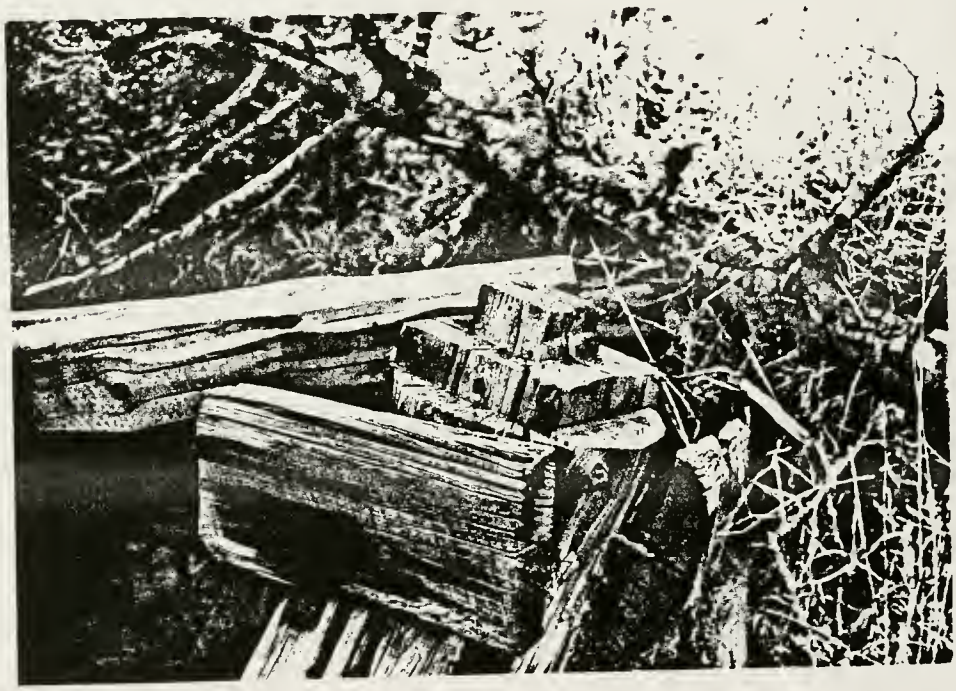

Figure 228. Feature #110, closeup of square set timbering in mine portal.

Features #111 and #112 consist of two caved mine adits and a large waste development dump that extends several hundred feet in a north-south direction. These are believed to have been associated with the south mine.

Feature #113 is a collapsed and caved mine shaft with a small waste development dump located to the west of the shaft.

Structure #114 (Figure 229) is a rectangular shaped wooden ore chute station that measures 10' X 23' X 11'. It represents the remaining portion of what was a larger ore chute station complex that served the south mine. Ore was moved by ore cars on a wooden trestle to this location and then hauled by wagon or truck to the mill or to another ore station where it was moved further down the hill by trestle or tramway. The chute was constructed of square timbers from a commercial mill. Large wire-cut round nails and spikes were used to hold the horizontal planks to the vertical members. This structure dates to the 1920-1930 period and is in poor condition.

Figure 229. Ore Chute Station (Structure #114), northeast view.

Feature #115 (Figure 230-231) consists of an adit, mine waste development dump and the remains of wooden trestle that carried ore cars down the slope of Mineral Hill. The adit is caved and inaccessible. The portal consists of two sets of square-set timber (4' X 6') approximately 4 feet apart. The wooden trestle, in poor condition, was a frame structure constructed with wire-cut round nails, 2 X 4's and 2 X 6's set on a square timber support framework that was cross-braced. The trestle is in extremely poor condition. This adit is tentatively identified as the 1212 or 1111 adit.

Figure 230. Feature #115 (adit), east view.

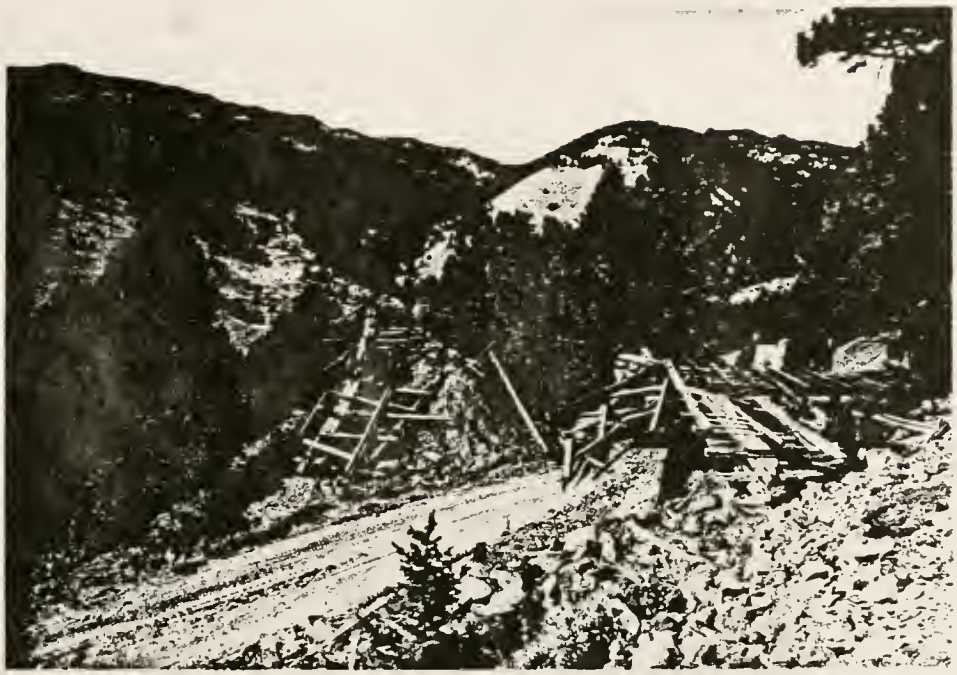

Figure 231. Feature #115 (trestle), northwest view.

Feature #116 (Figure 232) is a collapsed log ore bin and wooden frame trestle.

Figure 232. Feature #116, south view.

Feature #117 (Figure 233) is a caved, inaccessible mine adit. The portal is constructed of (4' X 6') square set timbers.

Figure 233. Feature #117, mine adit, east view.

Structure #118 (Figure 234) is a small wood frame outhouse (4' X 6' X8') with a plank walkway entrance.

Figure 234. Structure #118, northwest view.

Feature #119 is a caved inaccessible adit with the remains of a square-set timber portal.

Feature #120 is an open cut which is believed to be the part of #701 open cut developed by the Jardine Mining Company in the 1920's.

Features #121 and #122 are caved, inaccessible adits with square-set timber portals.

Structure #123 is a rectangular shaped wood frame building (7' X 17' X 8') with a gable roof and a flat ridge-top. The roof has a corrugated tin roof. The building has been moved recently and is in poor condition.

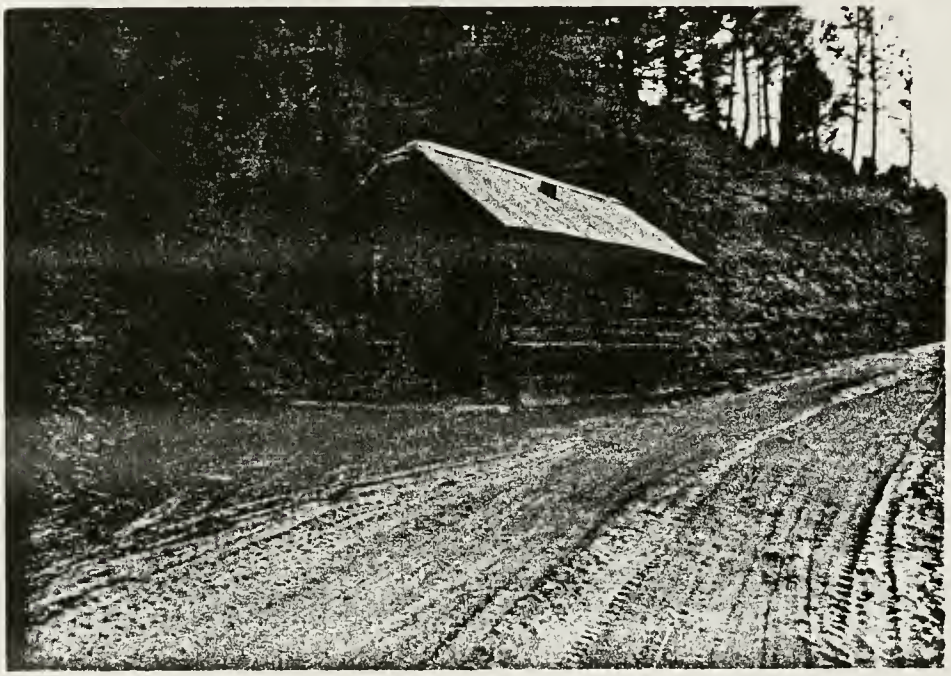

Figure 235 Structure #123, southeast view.

Feature #124 is a caved, inaccessible mine adit with the remains of a square-set timber portal.

Feature #125 is a waste development dump that appears to have originated from open cut #701 and Feature #127 (adit).

Structure #126 (Figure 236) is part of a collapsed wood frame trestle that carried ore cars from mines on Mineral Hill to an ore station lower down the hill. It has a square timber framework with cross-bracing and horizontal square timbers that support metal tracks on which the ore cars ran. This structure is in poor condition and is in danger of collapse. A small wood frame outhouse (Figure 237) is located just north of the trestle. It has a gable roof, unpeeled plank siding and sits on a wooden base.

Figure 236. Structure #126, southwest view.

Figure 237. Outhouse located near Structure #126, southwest view.

Feature #127 is a caved, in accessible mine adit with a square set timber portal.

Feature #128 is a large open cut in the west side of Mineral Hill that is believed to be the main portion of the #701 open cut developed by the Jardine Mining Company in the 1920's.

Feature #129 is a caved, inaccessible mine adit with a square set timber portal.

Feature #130 consists of a caved, inaccessible mine adit with a square set timber portal and a mine waste development dump.

Feature #131 consists of a caved, inaccessible mine adit with a square set timber portal and a mine waste development dump.

Feature #132 is a large open cut on the west side of Mineral Hill that is believed to be the North Cut, a major development done on the North Mine by the Jardine Mining Company in the 1920's. It contains two collapsed and caved mine shafts within its perimeter.

Feature #133 is a small open cut in the west side of Mineral Hill with a small mine waste development dump located west of the open cut.

Feature #135 consists of five caved, inaccessible mine adits. All show square set timber portals.

Feature #136 consists of two caved, inaccessible mine adits.

Features #134 and #137 (Figures 237-243) consist of a mine adit driven into the west side of Mineral Hill, a timbered shaft, an ore bin structure, a gravity ore chute and two waste development dumps. This is believed to be the Iron Duke Development (MSN 5528) filed on by Harry Bush and the Bear Gulch Mining Company in 1898.

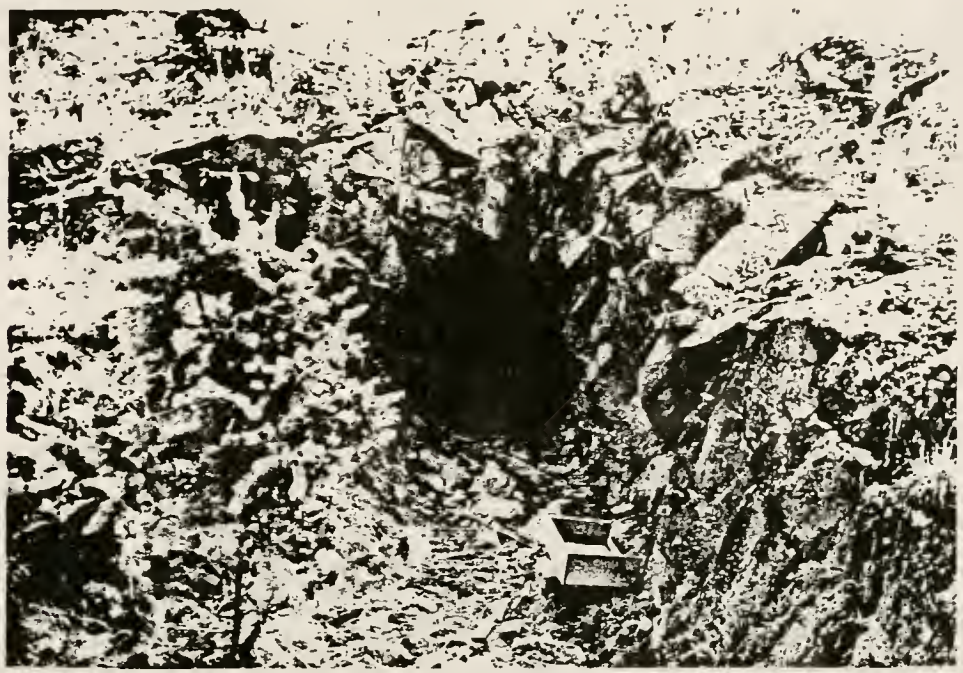

Figure 237. Feature #134, mine adit opening, east view.

Figure 238. Feature #134, 100 feet inside adit tunnel, east view into hill.

Figure 239. Feature #134, end of adit tunnel showing chute.

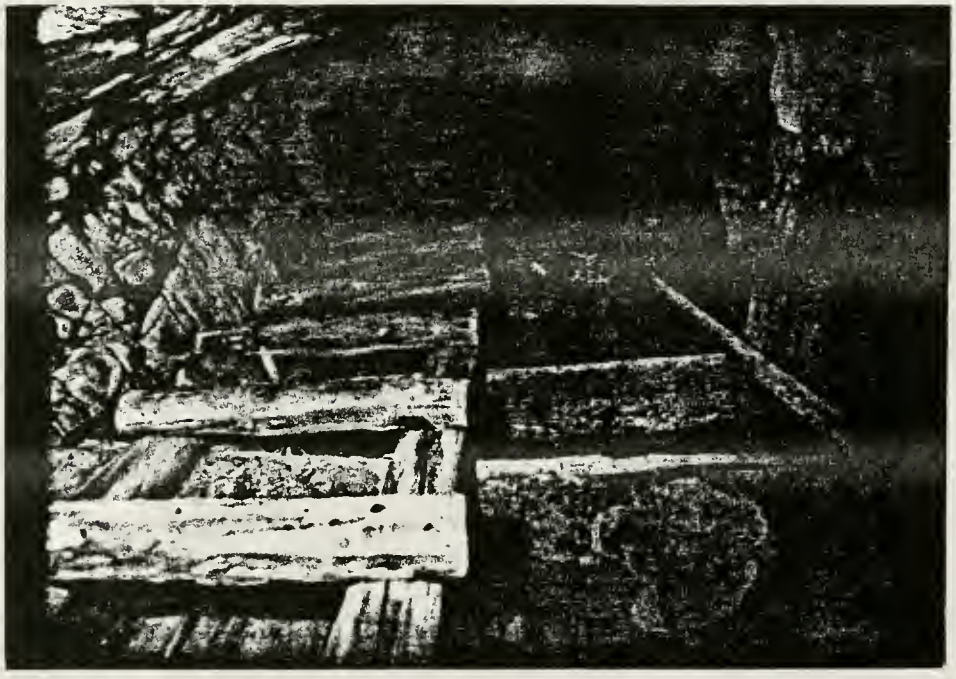

Figure 240. Feature #134, looking up raise to Feature #137, shaft.

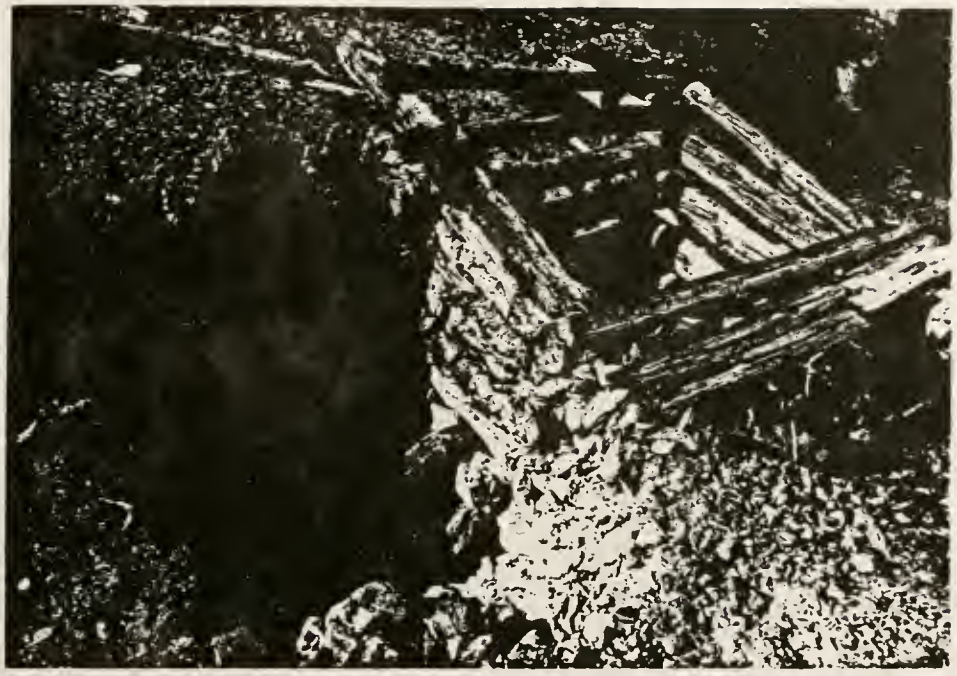

Figure 241. Feature #137, shaft with saddle-notch timbers in place.

Figure 242. Feature #134, gravity ore chute and log ore bin, northeast view.

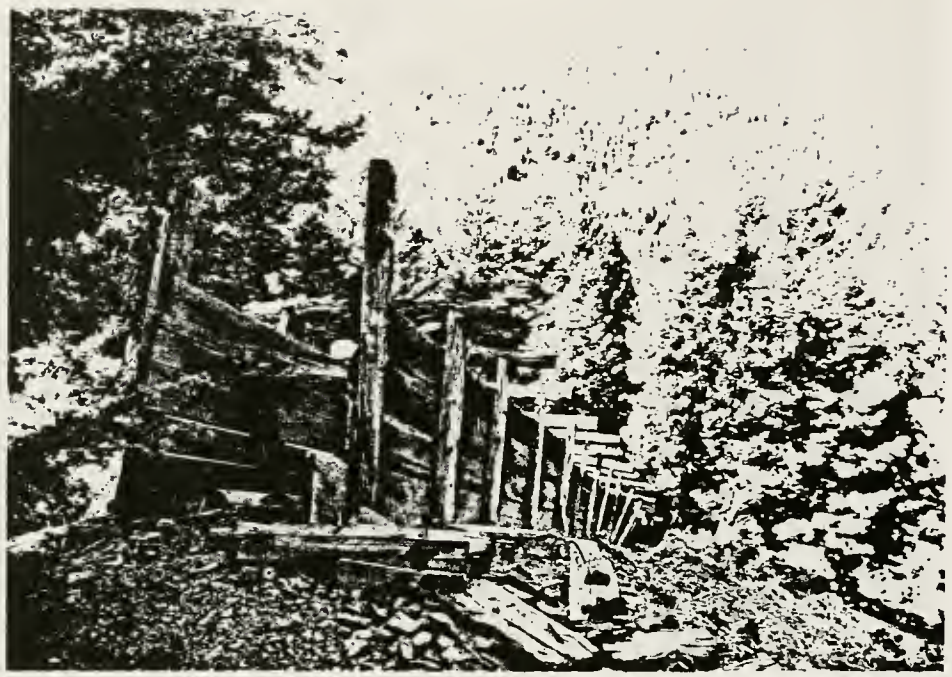

Figure 243. Feature #134, top of gravity ore chute standing on waste dump, west view.

Feature #138 (Figure 244) consists of a small open cut in the west side of Mineral Hill, and the collapsed remains of a gravity ore chute leading to the deteriorating remains of a log ore bin.

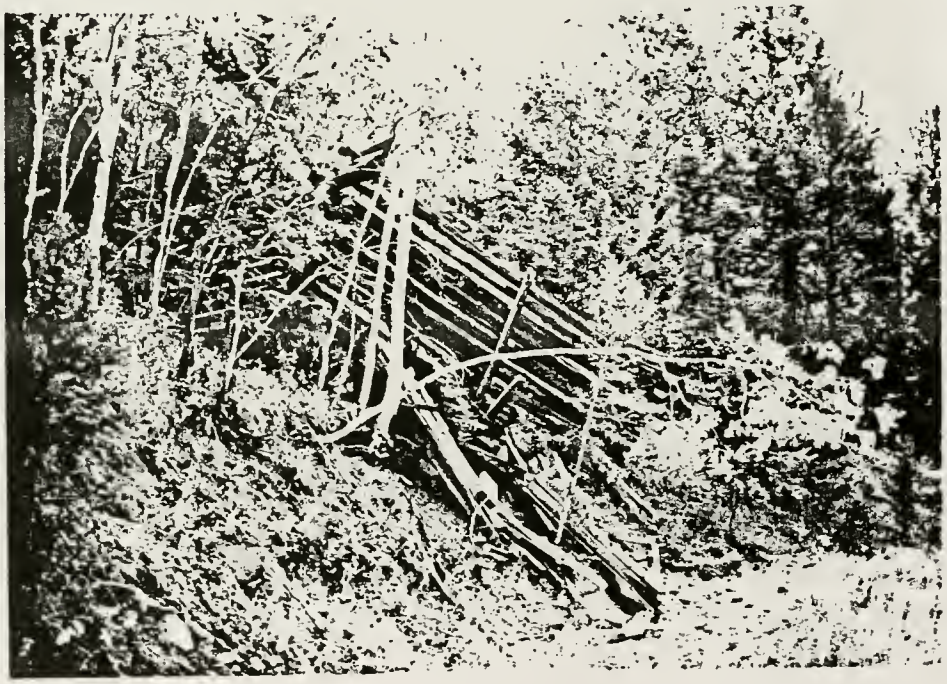

Figure 244. Feature #138, log ore bin, southwest view.

Feature #139 (Figure 245-246) consists of a caved, inaccessible mine shaft with the remains of a timbered collar. Just below the shaft about 50 feet down the hill is a deteriorating log ore bin.

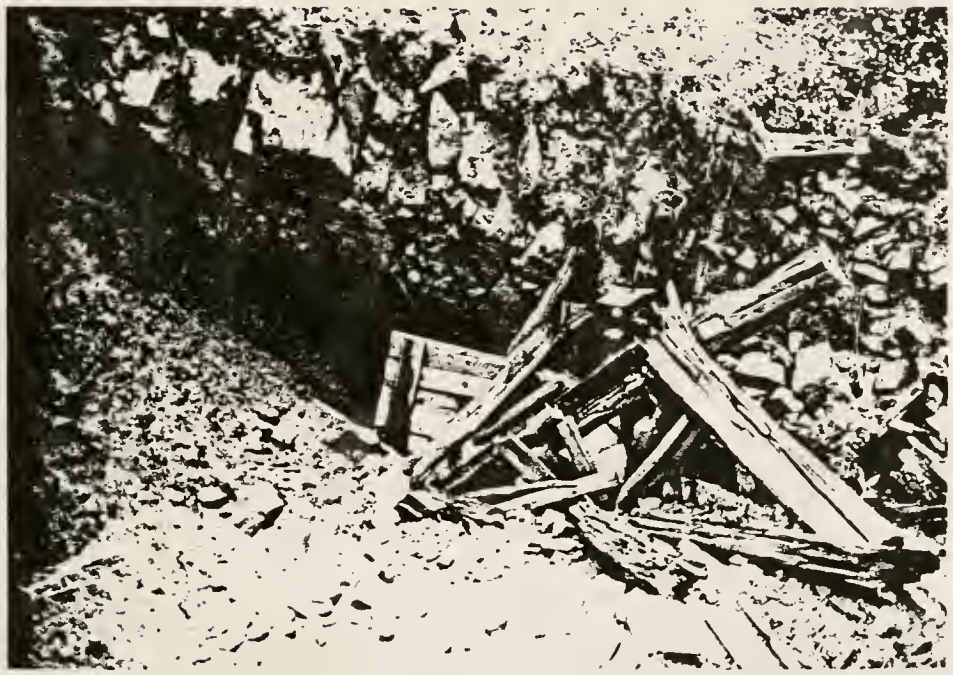

Figure 245. Feature #139, collapsed shaft with remains of timbered collar, east view.

Figure 246. Feature #139, log ore bin, southwest view.

Features #140 and #141 (Figures 247-250) consist of one of the older mine workings located. This feature is situated just east of the top of Mineral Hill and includes a collapsed adit, two collapsed shafts and two waste development dumps. The timbers in the adit are not square set like most all previously described adits. The timbers are held together with square nails which place this mine working in the 1880's or 1890's.

Figure 247. Feature #140, development dump, north view.

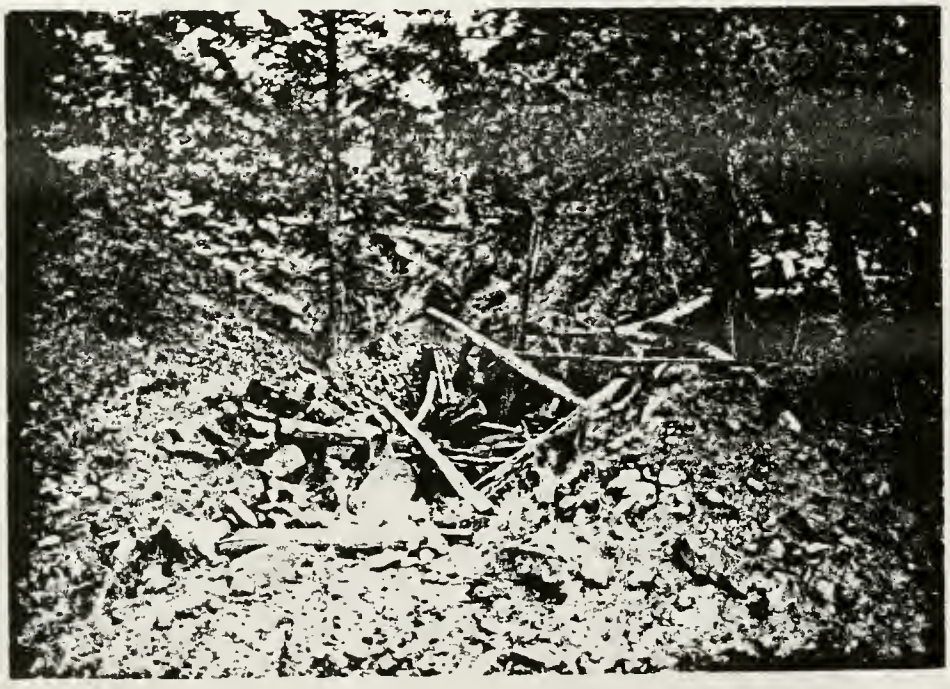

Figure 248. Feature #140, collapsed adit, northeast view.

Figure 249. Feature #140, closeup of collapsed adit, northeast view.

Figure 250. Feature #141, collapsed shaft with collar timbers, east view.

Feature #142 (Figure 251) consists of four mine waste development dumps, two caved adits with square set timber portals and a log and wood plank ore bin with a gravity ore chute. This is believed to be the Graham Lode, one of the earlier workings on Mineral Hill. An arrastre was built here in the 1880's to process free-milling gold ore by Joseph Brown. There is no evidence of this earlier activity. The structures and features at this complex appear to date to the 1910-1930 period. The Graham Lode (MSN 47) was filed on by Joe Brown in the early 1880's.

Figure 251. Feature #142, ore bins and gravity ore chute, east view.

Features #143-150 all consist of caved and inaccessible mine adits with their associated waste development dumps.

Feature #151 (Figures 252-254) consists of a mine adit presently being reopened and retimbered by the Homestake Mining Company, a waste development dump, a wood frame shack (6' X 13' X 7'), the remains of a wooden ore car trestle and ore bins contained in a square log and plank structure.

Figure 252. Feature #151, new portal under construction, northeast view.

Figure 253. Feature #151, wood frame shack on left and wood trestle on right behind square set timbers, southwest view.

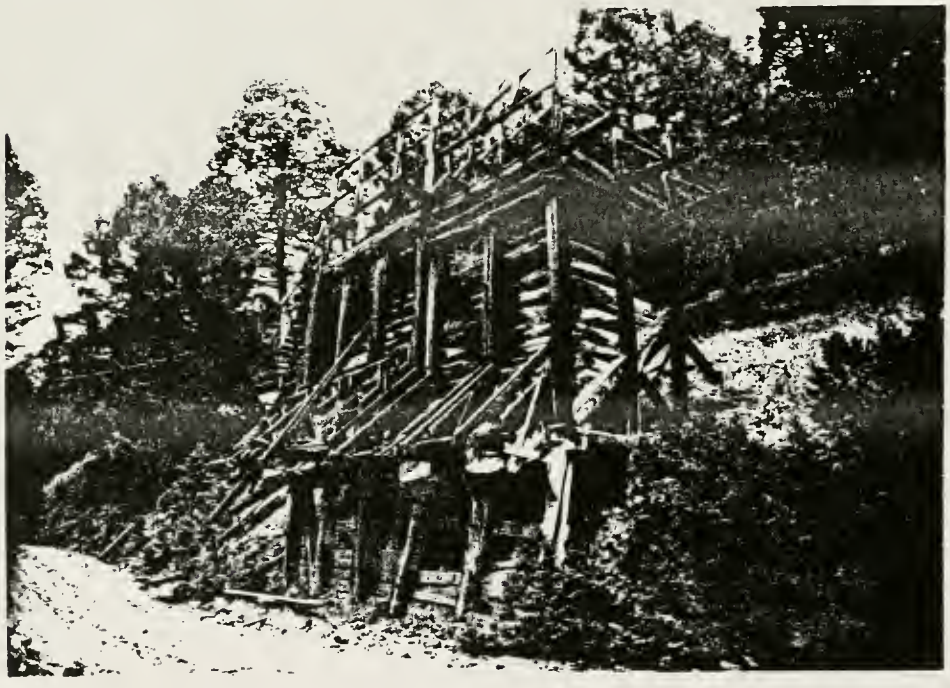

Figure 254. Feature #151, ore bins, northeast view.

Feature #152 consists of two caved, inaccessible mine adits with associated waste development dumps.

Features #153 and #154 consist of two open cuts and associated waste development dumps. These appear to be the No. 601 cut developed by the Jardine Mining Company in the 1920's.

Feature #155 consists of two caved mine shafts with associated waste development dumps.

Feature #156 is a large open cut probably associated with the south mine.

Feature #157 is a small open cut.

Features #158-#160 consist of three waste development dumps, a small open cut, and a collapsed adit. These features appear to be the remains of the Elk Tunnel Development.

Feature #161 consists of a waste development dump and two large open cuts in the west side of Mineral Hill. It is believed that this feature is located on the Mountain Chief Lode Claim (MSN 46) filed by Joe Brown in the early 1880's.

Feature #162 consists of a caved, inaccessible mine shaft and four waste development dumps. This feature is believed to be located on the Tip Top Lode (MSN 48) filed by Joseph Brown in the 1880's.

This concludes the description of the historical mining sites located on the west side of Mineral Hill. Just east (300') of Feature #141 is a historical site (24PA185) recorded by Marilyn Bailey, a Forest Service archeologist with the Gallatin National Forest in Bozeman in 1980. This site consists of the remains of two log structures (Figures 255-257). These two cabins were constructed of hand-hewn logs utilizing square nails and probably represent the remains of some of the earlier structures found in the Jardine area dating to the 1880's or 1890's. Only four or five logs remain standing on each wall. The cabin on the north has a small north facing window that has been framed. The door faces south towards the doorway of the second cabin. The cabins are approximately 7 feet apart. The corner joinery exhibit saddle and dove-tail notching. There is no historic debris in the area. The cabins may be located on the Lippitt Lode (MSN 5533).

Figure 255. Mineral Hill Cabins (24PH185), northeast view showing two cabin ruins.

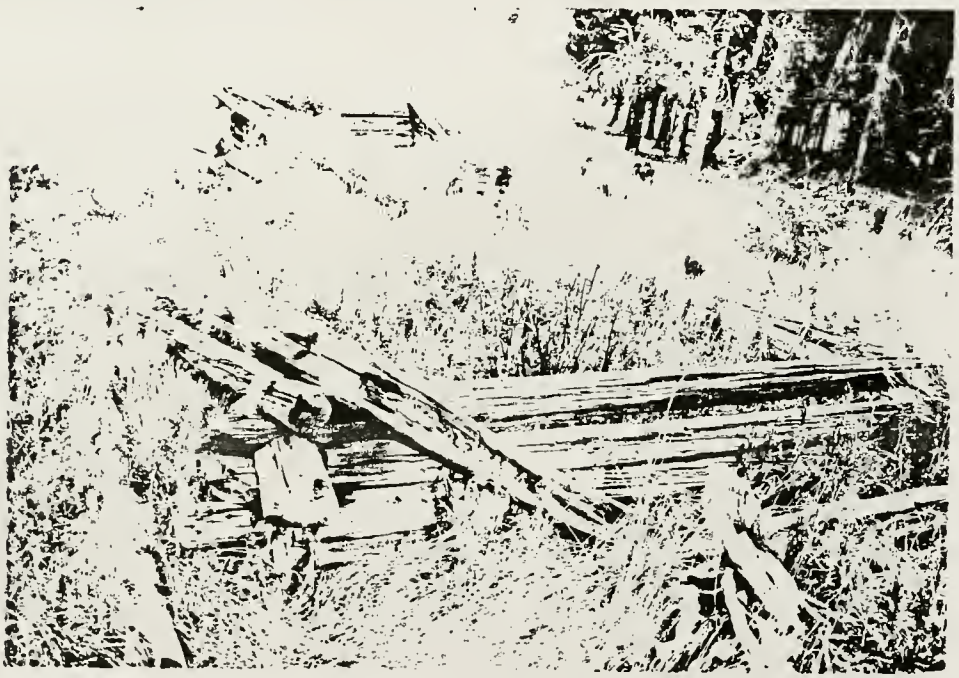

Figure 256. Mineral Hill Cabins (24PA185), northwest view showing two cabin ruins.

Figure 257. Mineral Hill Cabins (24PA185), east view of cabin wall.

As one drives north of Mineral Hill on the west side towards Pine Creek three additional historical features are encountered.

Feature #163 (Figure 258-267) is the Stuart-Schultz cabin complex which was recorded by Marilyn Bailey, Forest Service archeologist in 1980. This complex was assigned site number 24PA410. The site is located on a hillside overlooking Pine Creek about one mile east of Jardine. The cabin was built prior to 1899 by James E. Stuart on his mining claim. He sold it in 1899 and moved out of the area, later to become a doctor in Livingston. The cabin was occupied for many years thereafter by a man named Schultz. The cabin is actually comprised of three log cabins. At the SW end is a 15' X 28' two-room cabin, with the ridge line of its roof running NW-SE. This cabin is connected to the middle cabin by a 5' wide passageway, reminiscent of the dog run of early Southern cabins. The middle cabin is one room 14' X 15" and the other end cabin is one room and 14' X 18'. These are two distinct cabins connected by a two foot-long passageway. There is rock fill between the walls of the two cabins. The ridge lines of both of these latter cabins run SW-NE. There is a 4' wide porch running along the NW side of the two one-room cabins. The two-room cabin is of round logs with half dove-tail joints. The two one-room cabins are of round logs with saddle-V notches. The two-room cabin has a plank roof with deteriorated tar paper. The two one-room cabins have a split rail roof covered with dirt which in turn is covered with a wood shingle roof. All portions of the Schultz/Stuart Cabin are settled badly and deteriorating.

To the SE of the cabin is log shed or barn, half of which is standing and half of which is collapsed. Each half is about 12" X 20'.

A letter written by Dr. James E. Stuart to A.C. Jardine, former secretary of Bear Gulch Mining Company in 1915 confirms the fact that this cabin was built ca. 1899 by Stuart.[315]. The Forest Service site form associates this cabin with mining claims filed by Frank J. Miller in the 1940's. This cabin complex, while probably utilized by Mr. Miller, dates to the late 1890's and is associated with Dr. James Stuart who in 1899 was the assayer for Harry Bush and the Bear Gulch Mining Company.

Figure 258. Stuart-Schultz Cabin (24PA410), north view of site, cabin is on left, collapsed log shed-barn on right.

Figure 259. Stuart-Schultz Cabin (24PA410), east view of log-shed barn.

Figure 260. Stuart-Schultz Cabin (24PA410), south view.

Figure 261. Stuart-Schultz Cabin (24PA410), west view.

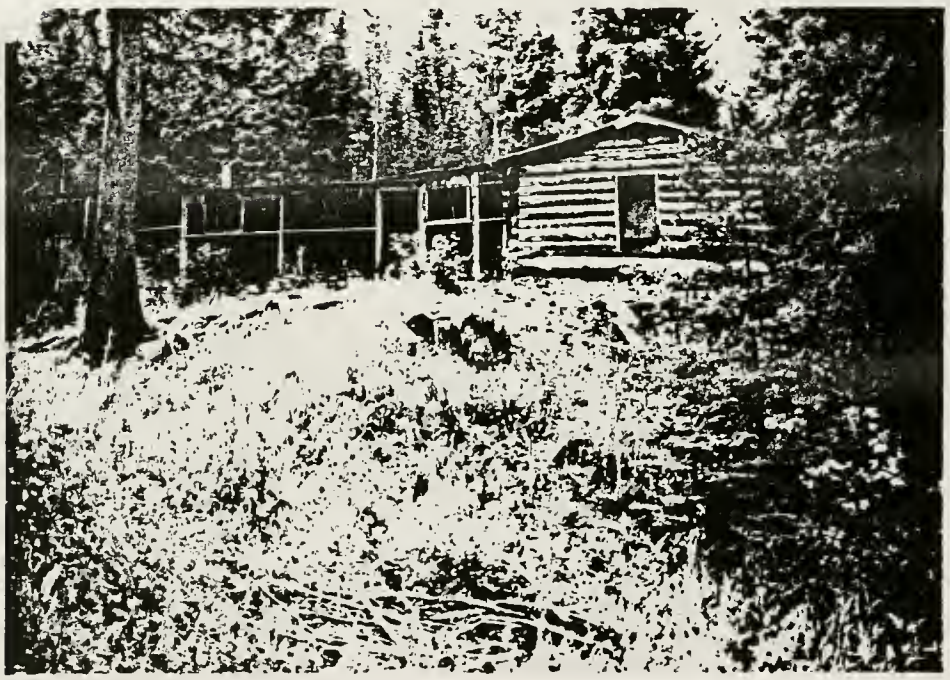

Figure 262. Stuart-Schultz Cabin (24PA410), east view.

Figure 263. Stuart-Schultz Cabin (24PA410), northeast view.

Figure 264. Stuart-Schultz Cabin (24PA410), northwest view showing entrance.

Figure 265. Stuart-Schultz Cabin (24PA410), west view showing entrance to passageway that links two cabins.

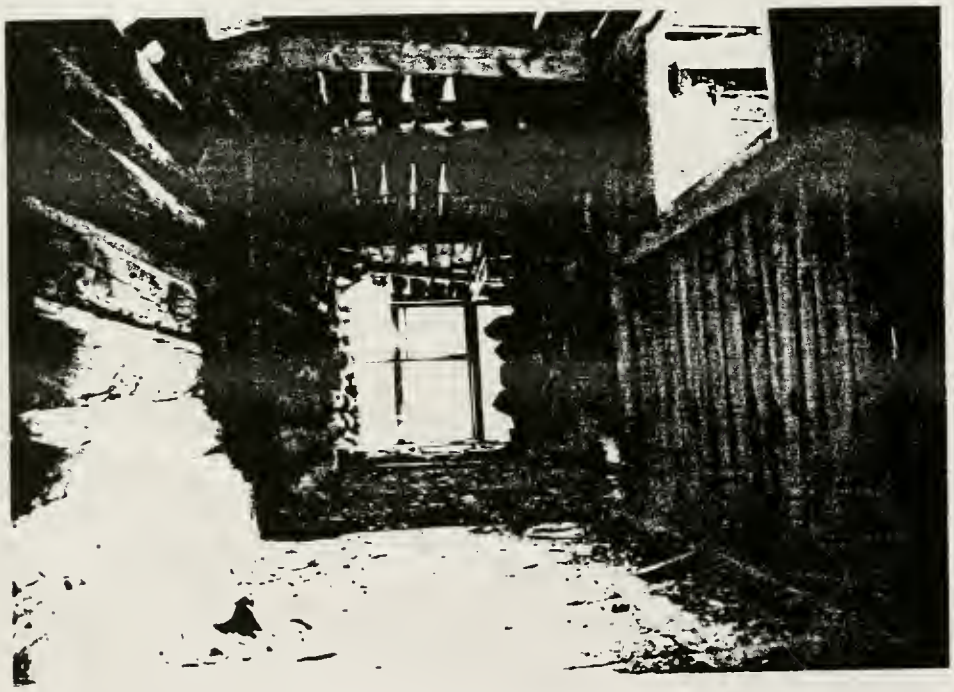

Figure 266. Stuart-Schultz Cabin (24PA410), west view into passageway that is remininscent of the dog run of early cabins in the southern United States.

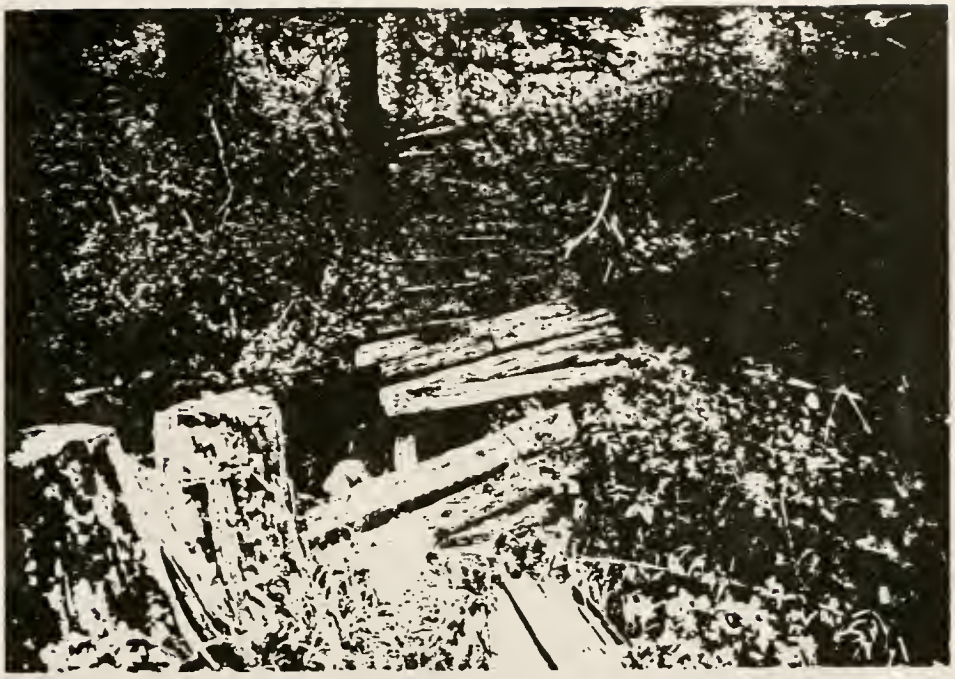

Figure 267. Stuart-Schultz Cabin 24PA410), west view below cabin showing foot bridge across Pine Creek that leads to Diversion Dam (Structure #164).

Located approximately 75' west of the Stuart-Schultz cabin is the original diversion dam for the Jardine Water supply system (Feature #164). This site includes the dam, a settling pond and a debris gate at the head of the pond made of wood slats and designed to act as a filtration device. Leading away from the pond is a wood flume which has been retrofitted with the PCV pipe that leads to the Water Tank Building (Structure #36) described earlier in this report. This water system was constructed ca. 1899-1903.

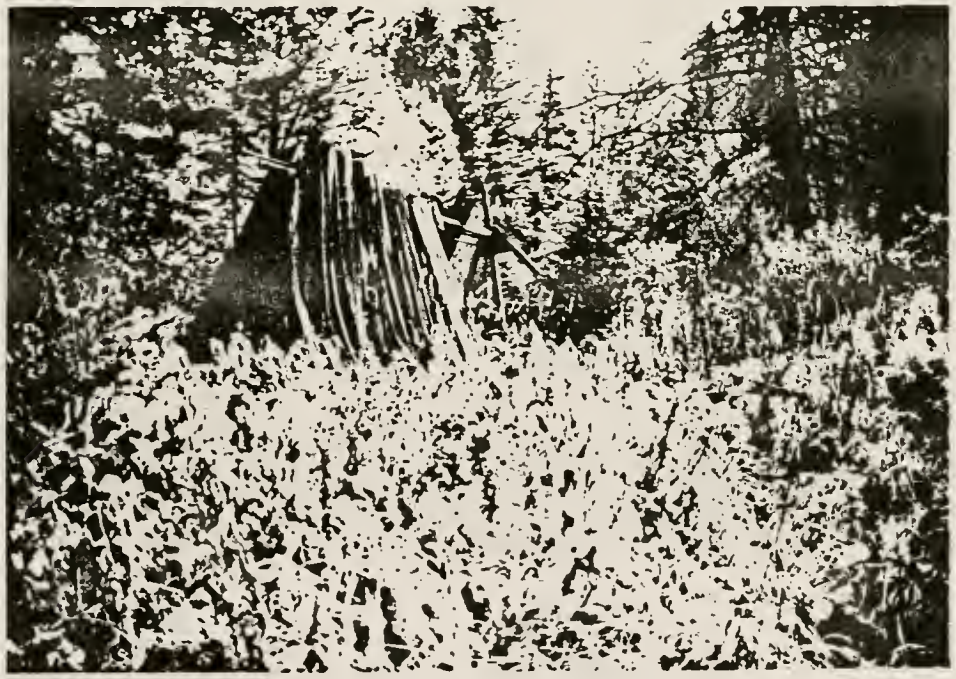

Figure 268. Diversion dam shed roof (Feature #164), southview.

Figure 269. Feature #164, west view of debris gates of diversion dam.

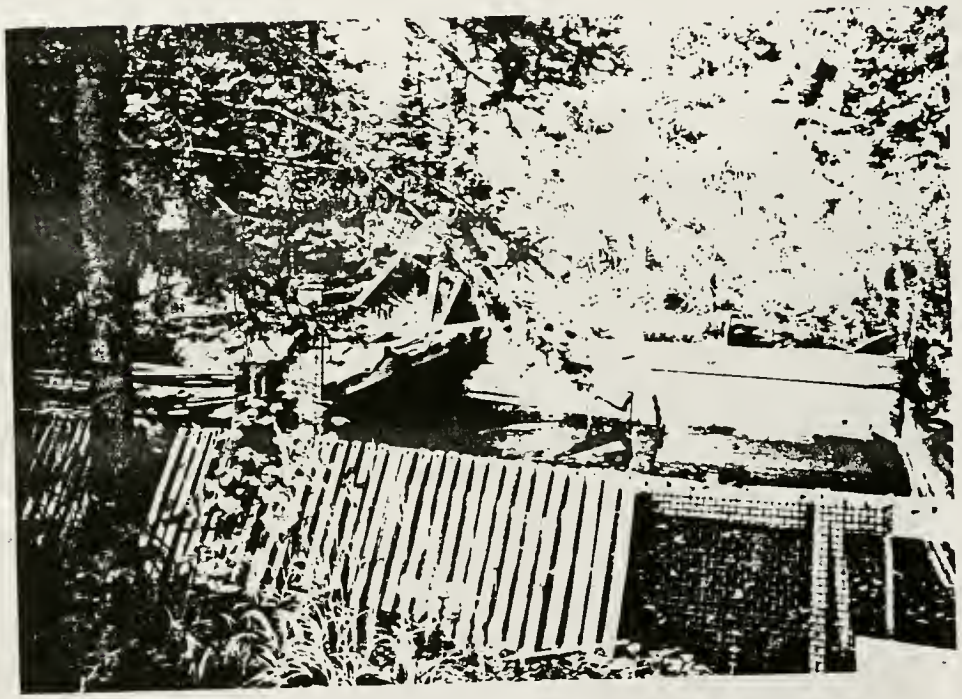

Figure 270. Feature #164, west view of debris gates of diversion dam.

Figure 271. Feature #164, north view of debris gate of diversion dam.

Figure 272. Feature #164, south view of wooden water flume that connected diversion dam to Water Tank Building (Structure #36).

Feature #165 (Figures 273-276) is the Jardine Cemetery located approximately 260 feet west of Feature #164. The Jardine Cemetery located on a flat bench covered with pine trees covers an area approximately 220' (north-south) and 60' (east-west). There are thirty-three discernable graves in this cemetery. Twenty-three of these are marked while ten are not. The earliest marked burial is 1899, while the most recent is 1972. The Jardine Cemetery is probably the only cemetery that has "Welcome" at the front gate. The first gravestone, as one enters the cemetery, is that of George Welcome, prominent Jardine businessman, miner and associate of Harry Bush. There are no distinguished examples of cemetery art or architecture at this site. There are several graves of young children dating to the early part of the century.

Burials in the Jardine Cemetery

1. John McCann March 3, 1871 - January 14, 1906 " At Rest " (marble).
2. James Smith November 26, 1846 - November 11, 1903 " At Rest " (marble).
3. Cecilia Smith 1853 - 1939 (granite).
4. James Ernest March 8, 1875 - October 18, 1906 " Beloved Son of James & Cecilia Smit
5. George W. Welcome June 17, 1853 - September 10, 1905 " At Rest " (marble).
6. unmarked boulder.
7. Minnie Herman January 27, 1860 - May 8, 1906 " Farewell, Dear Mother, Sweet Thy Rest
8. Orb H. Hansen May 27, 1917 - May 23,1972 (granite).
9. Del H. Hansen July 22, 1939 - August 26, 1962 (granite).
10. Monte Lee Lindstrom July 16, 1947 - July 10, 1964 (carved mountain scene with horse on granite).
11. unmarked.
12. Charles S. Cunningham 1907 - 1960 (horse carved on granite scene).
13. unmarked.
14. Doris Ostrenga 1932 - 1974 (tin plate marker).
15. unmarked.
16. unmarked - broken wood slat fence.
17. unmarked.
18. Stella May " Daughter of C.B. & J.A. Jones, Died August 5, 1902, Aged 2 years, 2 mon 18 days (marble with wood fence).
19. Winnie Harry " Died August 1, 1902 Aged 31 years, 9 months - Women of Woodcraft Courage Hope Remembrance - Forget her no, we never will, We loved her here, we love her still, nor love her less, although she is gone from us to her eternal home, Harr
20. James Condie " Died July 11, 1902, Aged 26 years At Rest ".
21. Fred C. Rife 1904-1910. (cement blocks with brass plates, marble in each corner blo
22. Robert R. Rife 1908-1908. same
23. Edward H. Rife 1900 - 1902. same
24. Jacob Adam " Infant Son of P. & C. Yarendt Died December 14, 1902, Budded on Earth t Bloom in Heaven " (marble with wood fence).
25. unmarked.
26. unmarked.
27. Mollie H. Downs 1874 - 1908 " Daughter Vera " (granite)
28. unmarked.
29. Alice May " Daughter of J.P. & I.M. Guest Born May 21, 1898 - Died May 22, 1902. "
30. Ida May Wife of J.P. Guest Born April 8, 1868 - Died September 8, 1902 (marble).
31. J.D. McLennan 1849 - 1931 (marble).
32. unmarked.
33. Maggie Yerala " Born July 13, 1868 Died May 14, 1899"(white marble with wood fence)

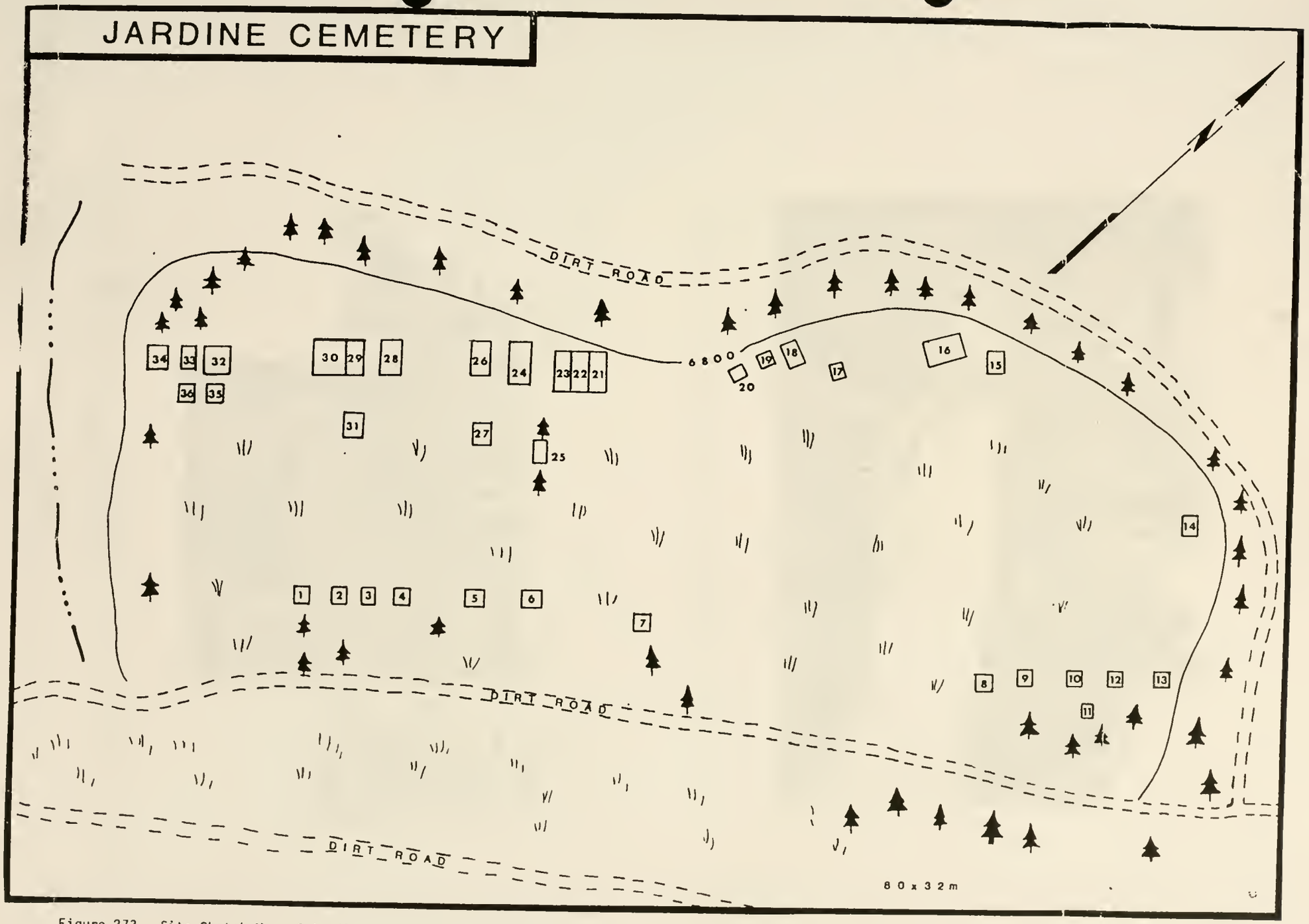

Figure 273. Site Sketch Map of Jardine Cemetery (Feature #165).

Figure 274. Jardine Cemetery (Feature #165), south view.

Figure 275. Jardine Cemetery (Feature #165), west view showing gravestone of George Welcome (1853-1905).

Figure 276. Jardine Cemetery (Feature #165), east view of gravestone of Minnie Herman (1860-1906), poured concrete sculpture mold.

Evaluation: Consisting of the town of Jardine, the cemetery, historical mine features on Mineral Hill, the water system diversion dam, the Revenue Mill, the Arsenic Mill and two previously recorded historical sites (24PA185 and 24PA410), this site has important significance in local, county, and state history. One hundred and sixty-five structures and features were identified during the field survey. They included log cabins, wood frame buildings, mine adits, mine tunnels, wooden trestles and two large wood frame mills.

From its beginnings as a small placer camp in the 1860's, Bear Gulch (Jardine) went through a developmental sequence similar to many other Montana mining camps. Small-scale placer mining was followed by well-financed hydraulic operations in the 1880's. Development of lode deposits started with the arrival of Harry Bush and Canadian capital in 1898. Bush transformed the small placer camp overnight into a town. Bush's star waned in less than two years due to a lack of continued financial backing.

Development of the Jardine mines was then hampered for nearly two decades by litigation. With the organization of the Jardine Mining Company in the early 1920's backed by New York capital, the mines had their most productive years from 1920-1940. During this period the Jardine mines were one of the largest gold producers in Montana. For a short period of time it was the major producer of arsenic in Montana, as well as the only (irregular) producer of tungsten ore in Montana.

National Register Statement: The Jardine site (24PA339) is eligible for listing on the National Register of Historic Places under criteria a, b, c and d. Jardine has significance in terms of local, county and state history. The town is associated with events that have made a significant contribution to the broad patterns of Montana history, most particularly mining and settlement phases. It also has importance in Montana corporate business history. Jardine is also associated with the lives of persons significant in Park County history (A.W. Miles, Harry Bush, George Phelps, George Welcome, A.C. Jardine, "Cabbage" Ryan, and Harry C. Bacorn) and state history (A.J. Davis, Miles Finlen, and Anton Holter). It has business and corporate connections to foreign investment firms in St. Johns, Canada and banks and stores in Helena and Butte.

The Revenue Mill and the Arsenic Mill and ancillary structures such as the electric sub-station, the compressor house, the blacksmith's shop and the assay office all contribute to Jardine's significance in Montana mining history.

The residential and mining office buildings in town contribute to the overall economic pattern of development and community growth in Jardine. They constitute distinctive characteristics of a type, period and method of construction. The mine mills have significance in understanding the development of various mining technologies, particularly in relationship to the reduction of low grade gold ores and the metallurgical methods developed at Jardine to extract arsenic and tungsten. The Jardine mines' tungsten deposits are amongst the earliest commercial lodes found in the United States.

The site of Jardine is likely to yield information important for understanding mining history in Montana and corporate development of the mining industry.

The site of Jardine is recommended for nomination to the National Register of Historic Places as an historic district. Jardine is an important and, by now, unique site. The buildings and context deserve respect. They provide evidence of a large segment of Montana mining history.

Recommendations: The Homestake Mining Company, owners of the majority of the Jardine site area, have not completely clarified their mining plans for this project area.

While the site of Jardine is recommended as eligible for the National Register, it is felt that the specific outline of the historic district should await further developments in the Homestake Mining Plan. At a minimum, it is felt that the historic district should include the buildings in the town-site area, the Revenue Mill (#34), the Arsenic Mill (#59), the electric sub-station (#54), the water system diversion dam (#164), the Water Tank Building (#36), the ore station (#37), the compressor house (#41), the blacksmith's shop (#43), and some of the mining features on the west side of Mineral Hill.

The basic recommendation to the Homestake Mining Company is an active commitment to preservation of the site. If this proves unfeasible, it is strongly recommended that complete recording of structures and features be done. This would include:

1) Measured architectural drawings of the Revenue Mill, the Arsenic Mill, the assay office, the electric substation, the compressor house, the blacksmith's shop, the Harry Bush guest house, the mine company office, the diversion dam, the Stuart-Schultz cabin, the school and some of the log residential buildings, as well as the intact mining structures on Mineral Hill.

2) Large format, perspective corrected photos should be taken of the Arsenic Mill and Revenue Mill.

3) Further historical research in the newspapers concerning Jardine.

4) Further collection of oral history concerning Jardine.

The Arsenic Mill may present a health hazard which has to be taken into consideration. Another possible recommendation would be to consider adaptive reuse of the Revenue Mill. The type of adaptive reuse is almost infinite and could range from stabilization of the structure to adaptation into space useable by the Homestake Mining Company.

PART VIII

SUMMARY

Two archeological sites and four historical sites were located and recorded during this project. The two archeological sites are the Johnson Family site (24PA159) and Sargon's site (24PA340). The Johnson Family site (24PA159) was previously recorded by Forest Service personnel in 1970. This site was remapped, surface collected and tested for subsurface cultural deposits. The Johnson Family site is recommended as eligible for the National Register of Historic Places. Sargon's site is recommended as not eligible for the National Register of Historic Places.

Two historical sites, the Stuart-Schultz Cabins (24PA410) and the Mineral Hill Cabins (24PA185) had also been previously recorded by Forest Service personnel. These sites were relocated and additional recording and historical research done on them. It is recommended that the Stuart-Schultz Cabins and the Mineral Hill Cabins are eligible for the National Register as part of an historic district. The Hanlon Hill Adits (24PA342), a new historical site, is recommended as not eligible for the National Register. The Jardine site (24PA339) is recommended as eligible for the National Register of Historic Places as an historic district.

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APPENDIX 1

Mineral Survey Plats

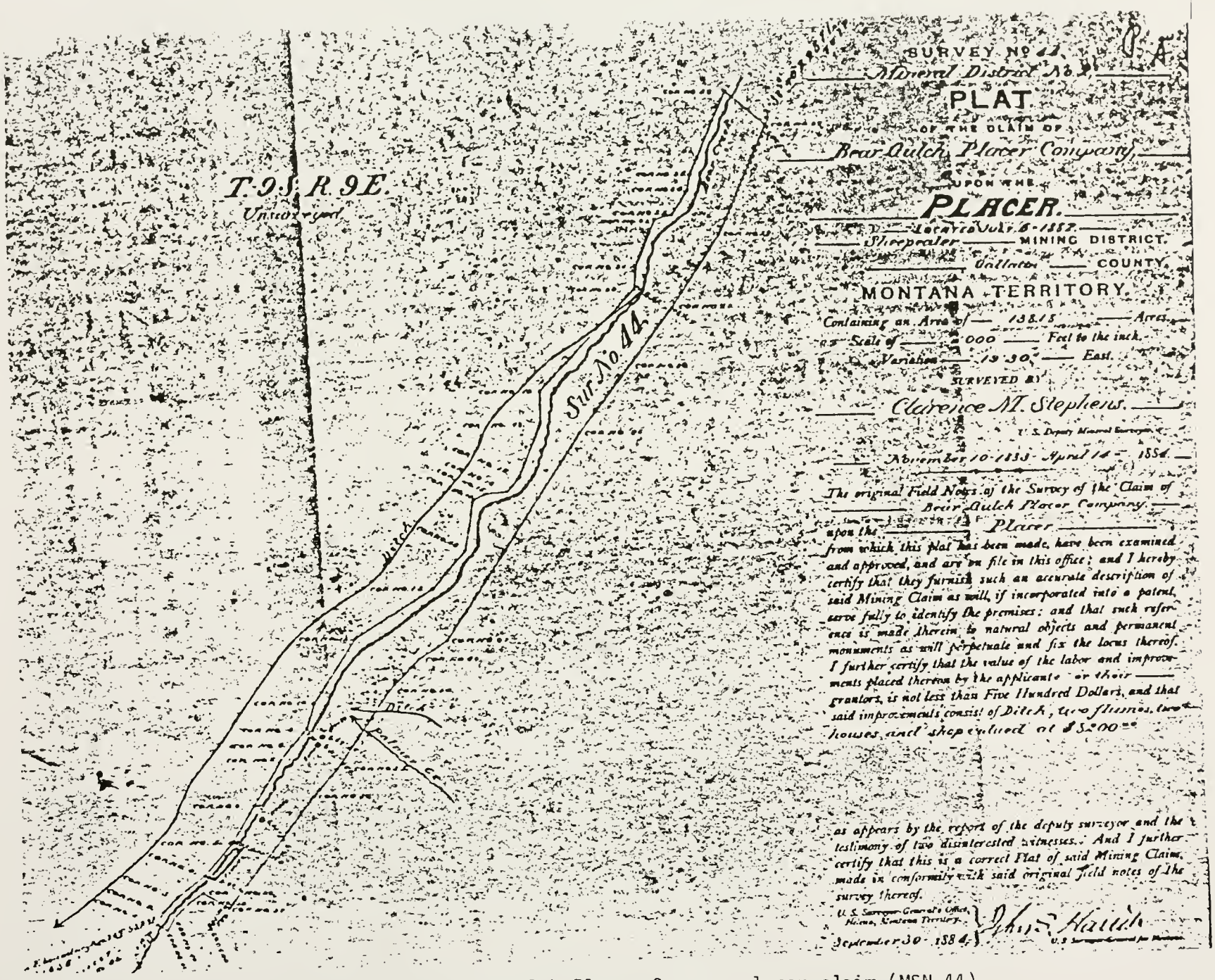


Figure 1-1. Mineral Survey Plat of Bear Gulch Placer Company placer claim (MSN 44).
Source: Gardiner Ranger District, United States Forest Service.

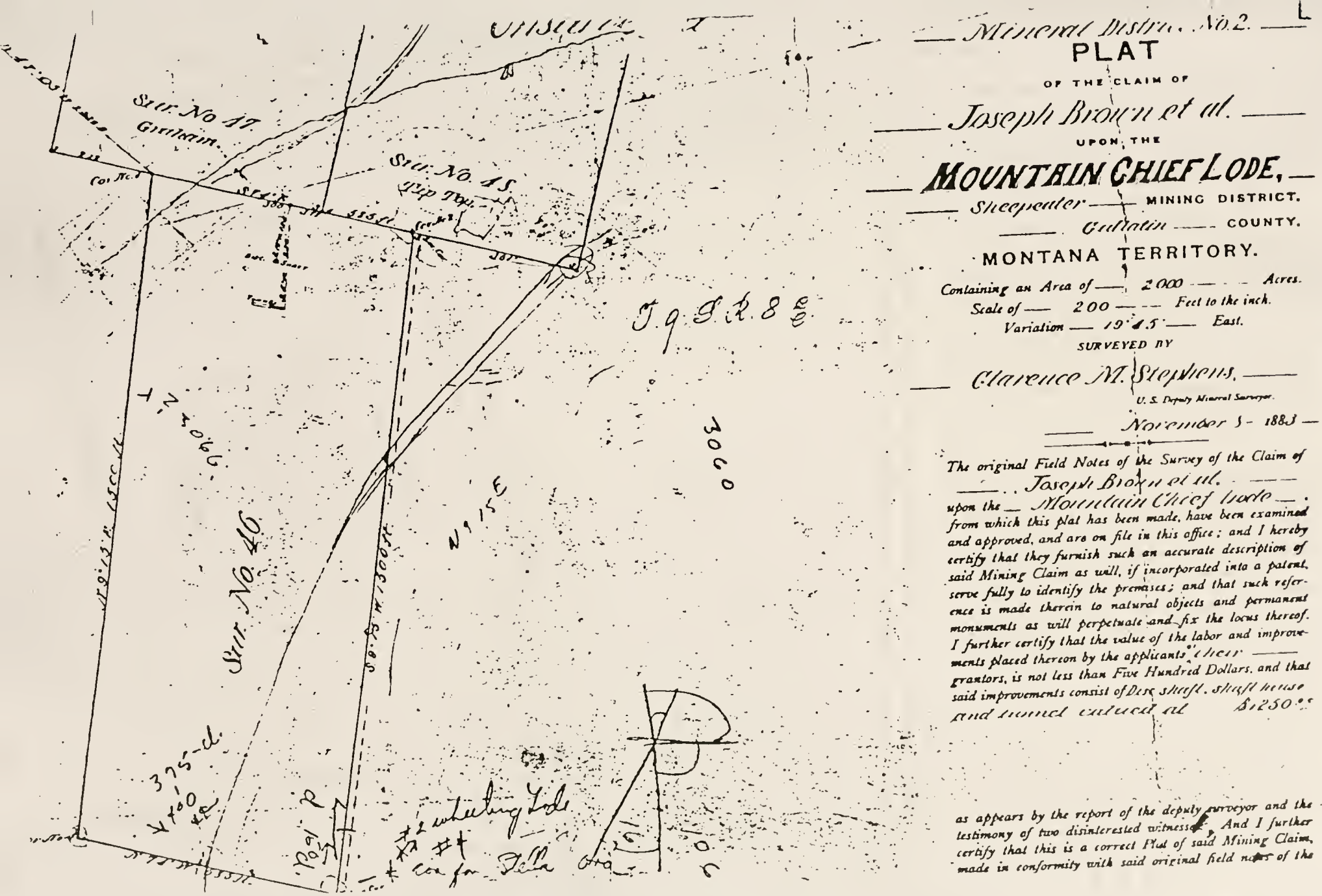
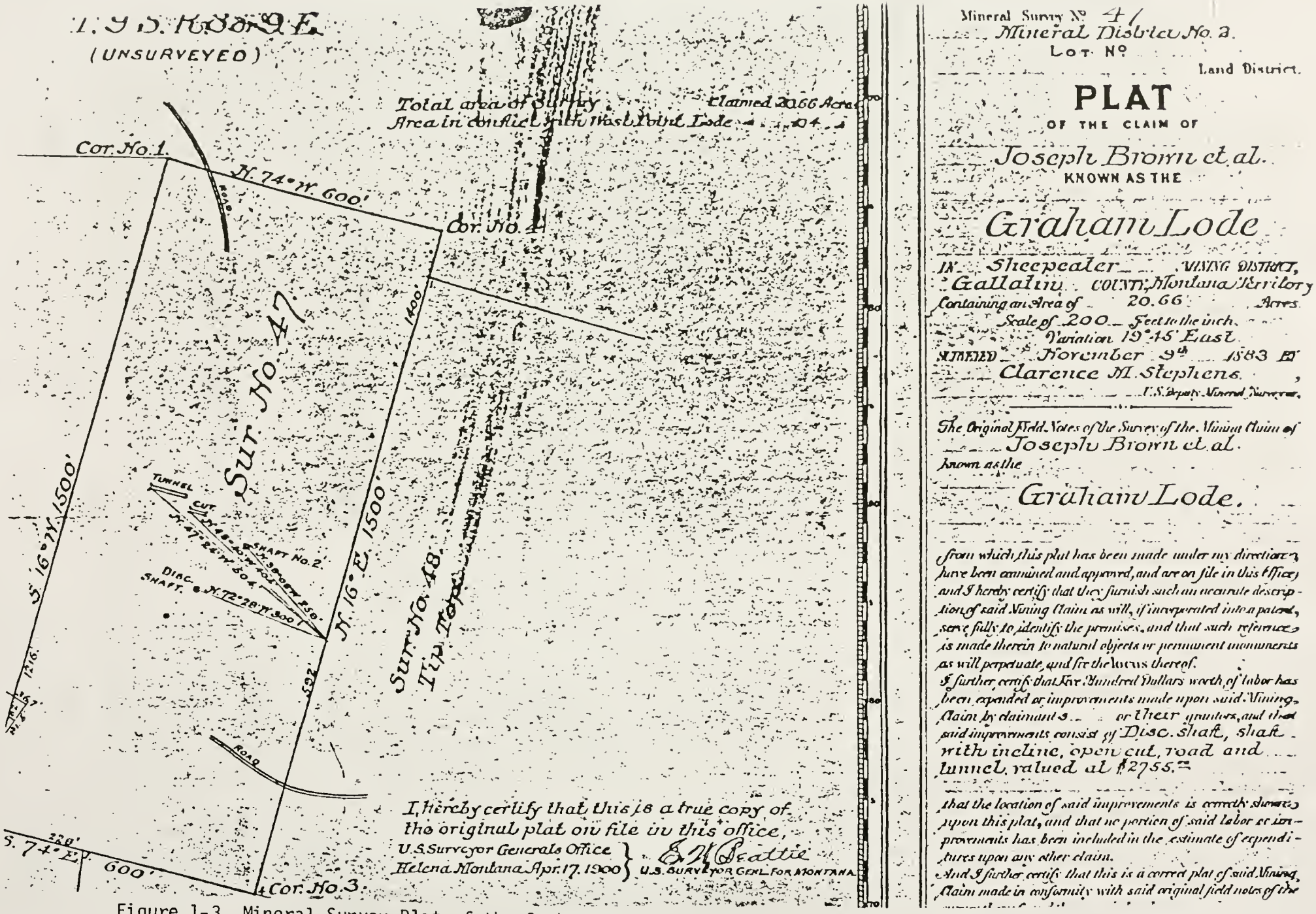


Figure 1-2. Mineral Survey Plat of the Mountain Chief Lode(MSN 46).
Source: Gardiner Ranger District, United States Forest Service.



Mineral Survey No. 47
Mineral District No. 3.
Lot No.
Land District.

PLAT

OF THE CLAIM OF

Joseph Brown et al.

KNOWN AS THE

Graham Lode

IN Sheepeater MINING DISTRICT,
Gallatin COUNTY, Montana Territory
Containing an Area of 20.66 Acres.
Scale of 200 Feet to the inch.
Variation 19° 45' East
SURVEYED November 9th 1883 BY
Clarence M. Stephens,
U.S. Deputy Mineral Surveyor.

The Original Field Notes of the Survey of the Mining Claim of Joseph Brown et al. known as the Graham Lode, from which this plat has been made under my direction, have been examined and approved, and are on file in this Office; and I hereby certify that they furnish such an accurate description of said Mining Claim as will, if incorporated into a patent, serve fully to identify the premises, and that such reference is made therein to natural objects or permanent monuments as will perpetuate and fix the locus thereof.

I further certify that Five Hundred Dollars worth of labor has been expended or improvements made upon said Mining Claim by claimants or their grantors, and that said improvements consist of Disc. shaft, shaft with incline, open cut, road and tunnel, valued at $2755.00

that the location of said improvements is correctly shown upon this plat, and that no portion of said labor or improvements has been included in the estimate of expenditures upon any other claim.

And I further certify that this is a correct plat of said Mining Claim made in conformity with said original field notes of the

Figure 1-3. Mineral Survey Plat of the Graham Lode (MSN 47). Source:Gardiner Ranger District, United States Forest Service.

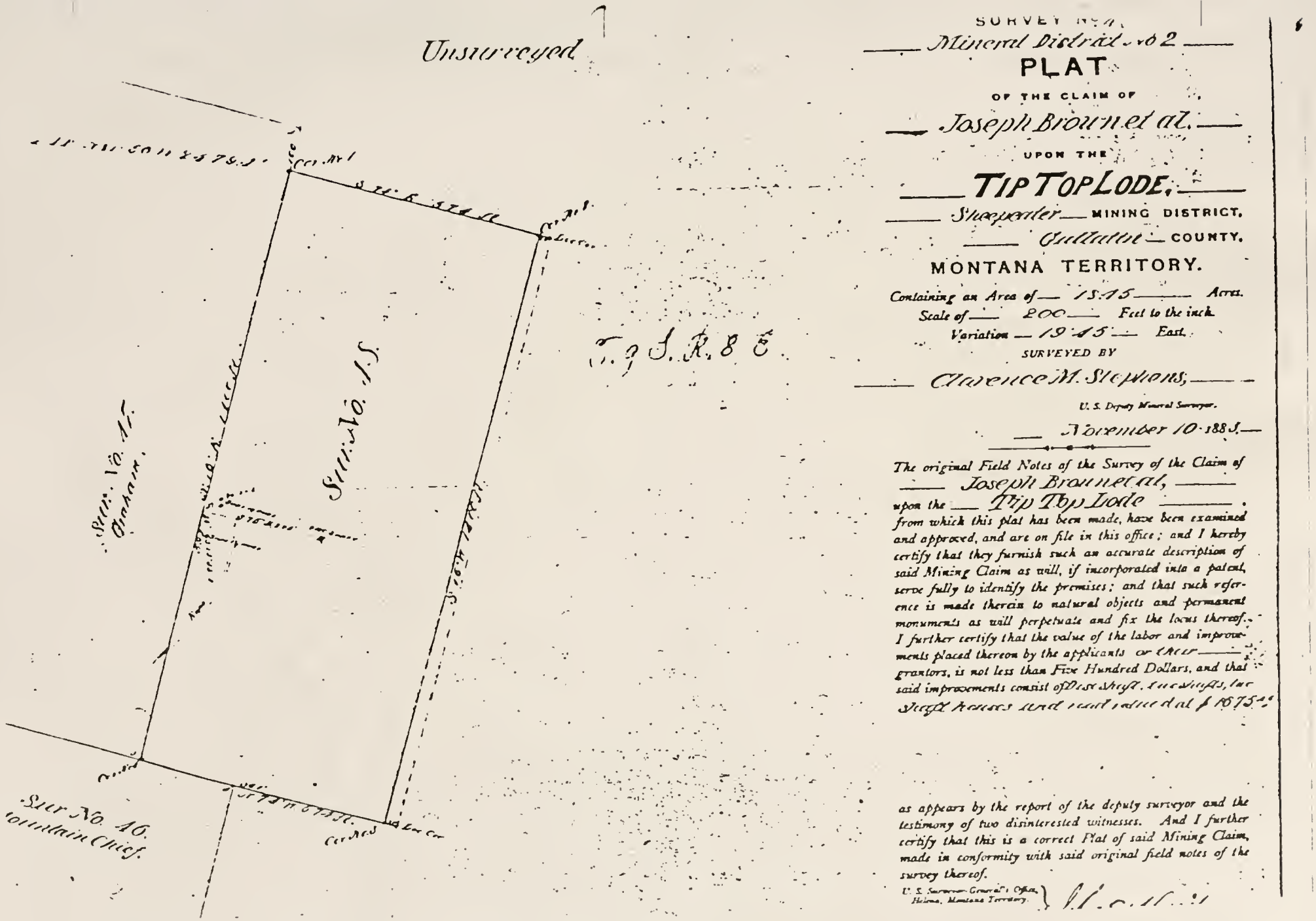


Figure 1-4. Mineral Survey Plat of the Tip Top Lode (MSN 48)
Source: Gardiner Ranger District, United States Forest Service.

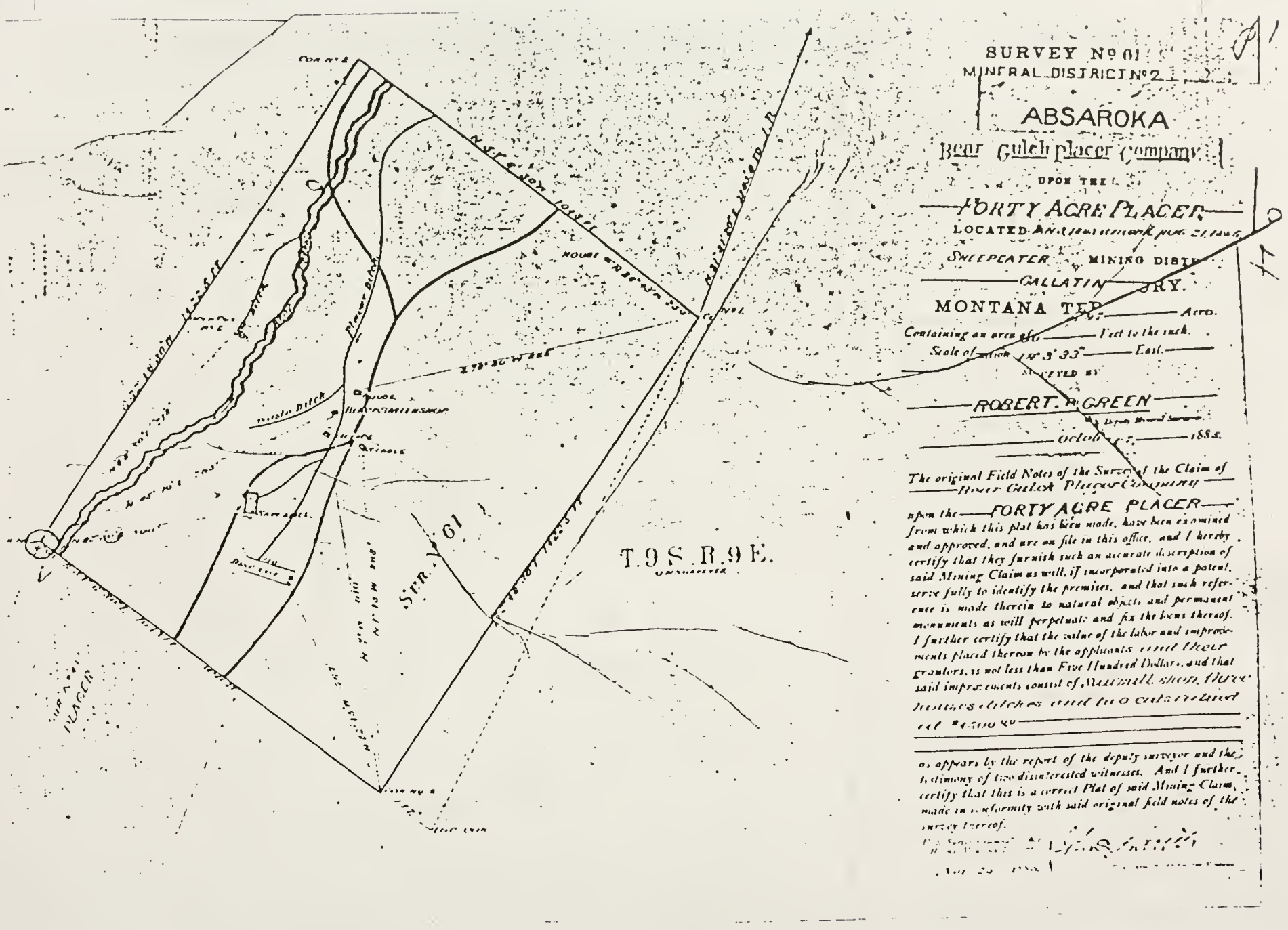


Figure 1-5. Mineral Survey Plat of the Forty Acre Placer (MSN 61) Source: Gardiner Ranger District, United States Forest Service.

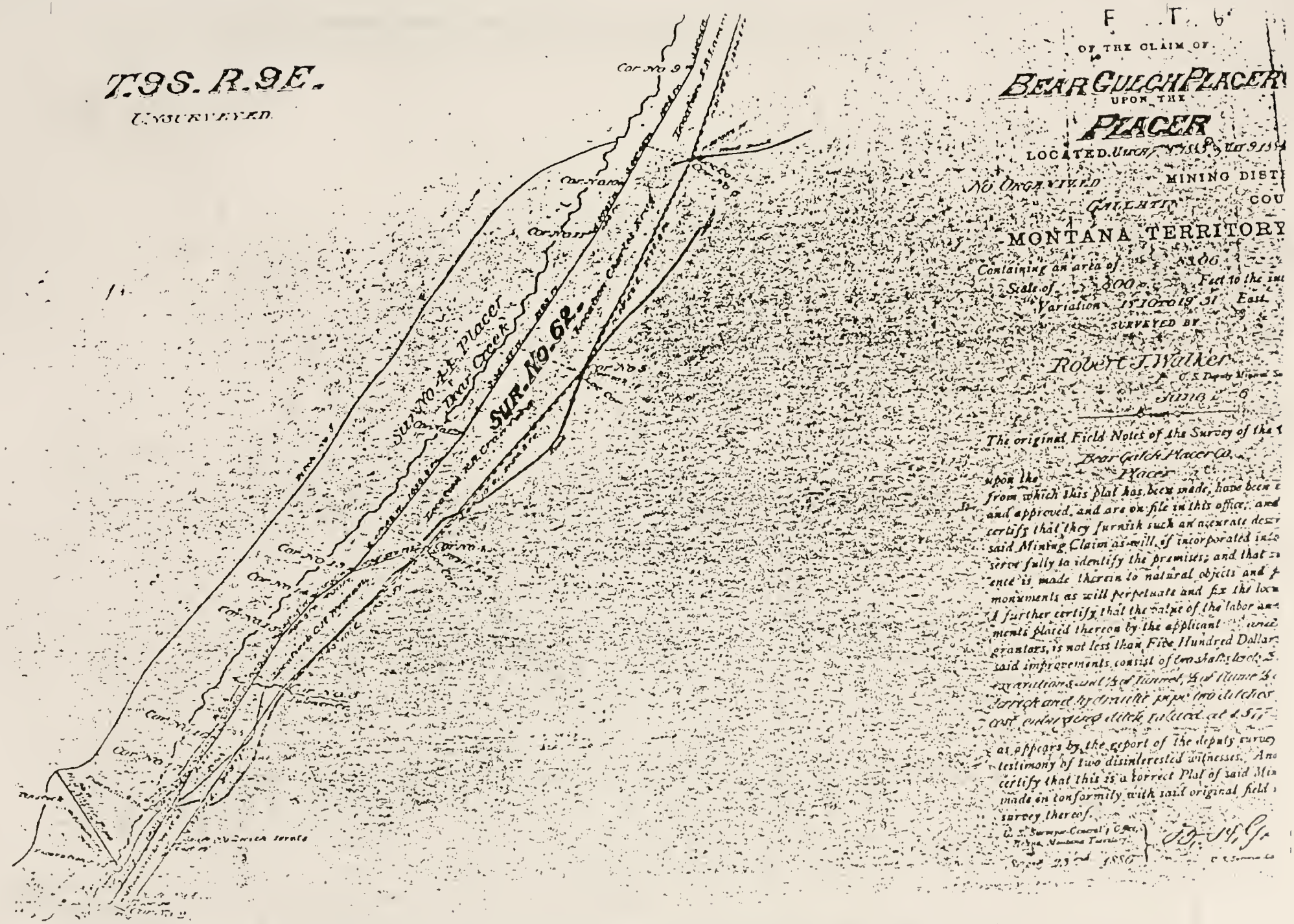


Figure 1-6. Mineral Survey Plat of the Bear Gulch Placer Company placer claim(MSN 62)
Source: Gardiner Ranger District, United States Forest Service.

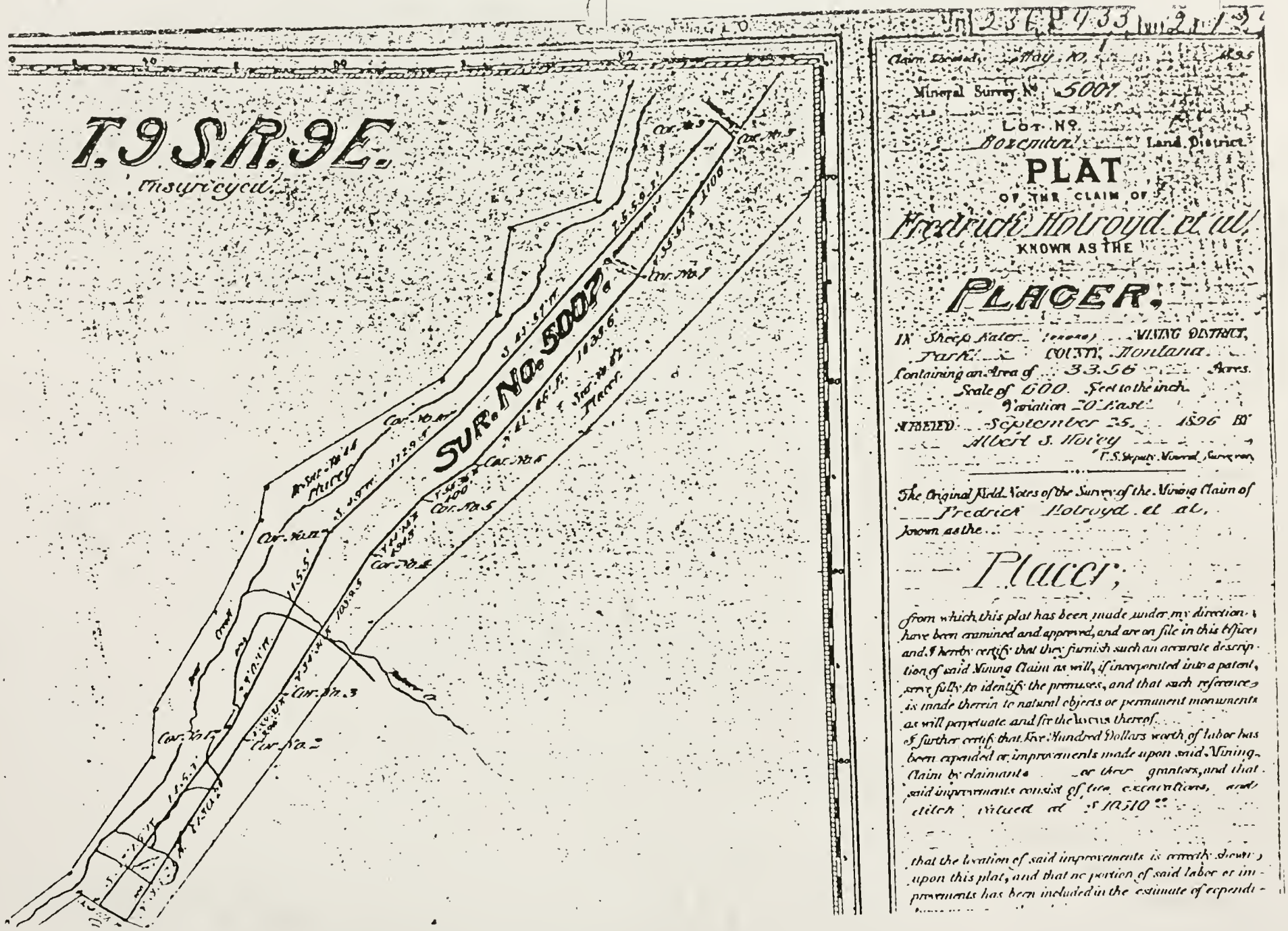


Figure 1-7. Mineral Survey Plat of the Frederick Holroyd Placer claim(MSN 5007)
Source: Gardiner Ranger District, United States Forest Service.

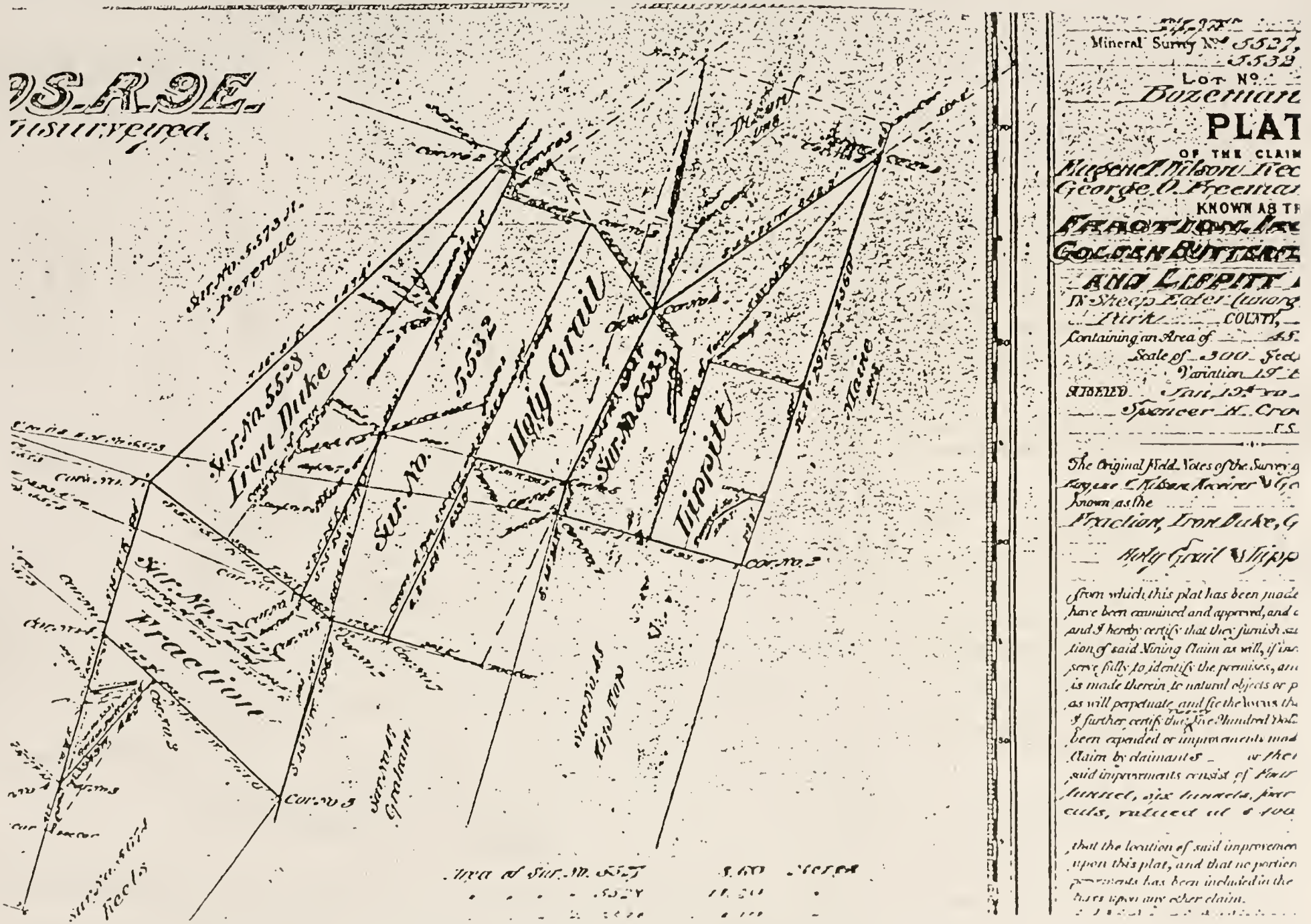


Figure 1-8. Mineral Survey Plat of the Fraction, Iron Duke, Golden Butterfly, Holy Grail and Lippit Lodes(MSN 5527,5528,5531,5532 &5533) Source: Gardiner Ranger District, United States Forest Service.

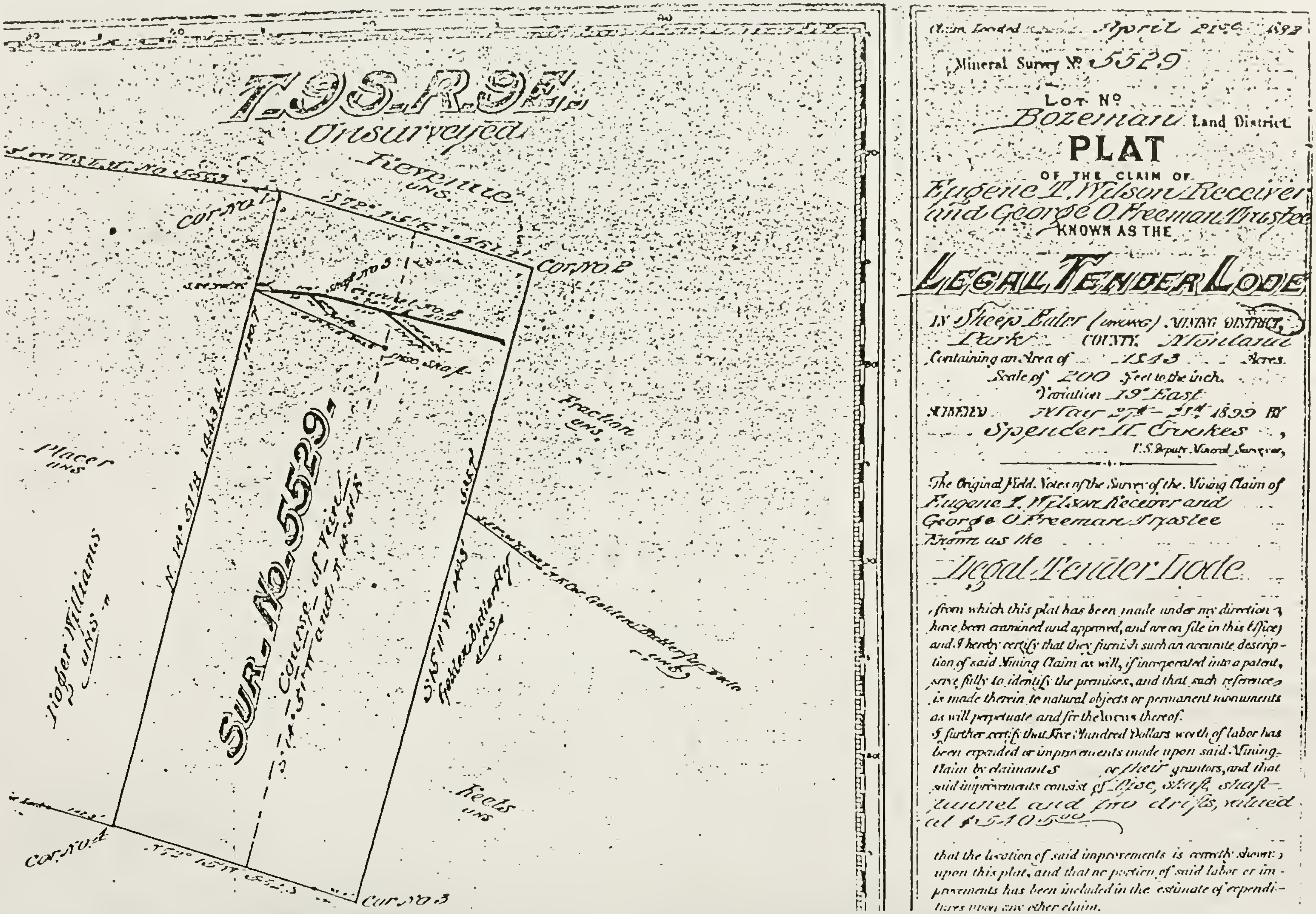


Figure 1-9. Mineral Survey Plat of the Legal Tender Lode (MSN 5529) Source: Gardiner Ranger District, United States Forest Service.

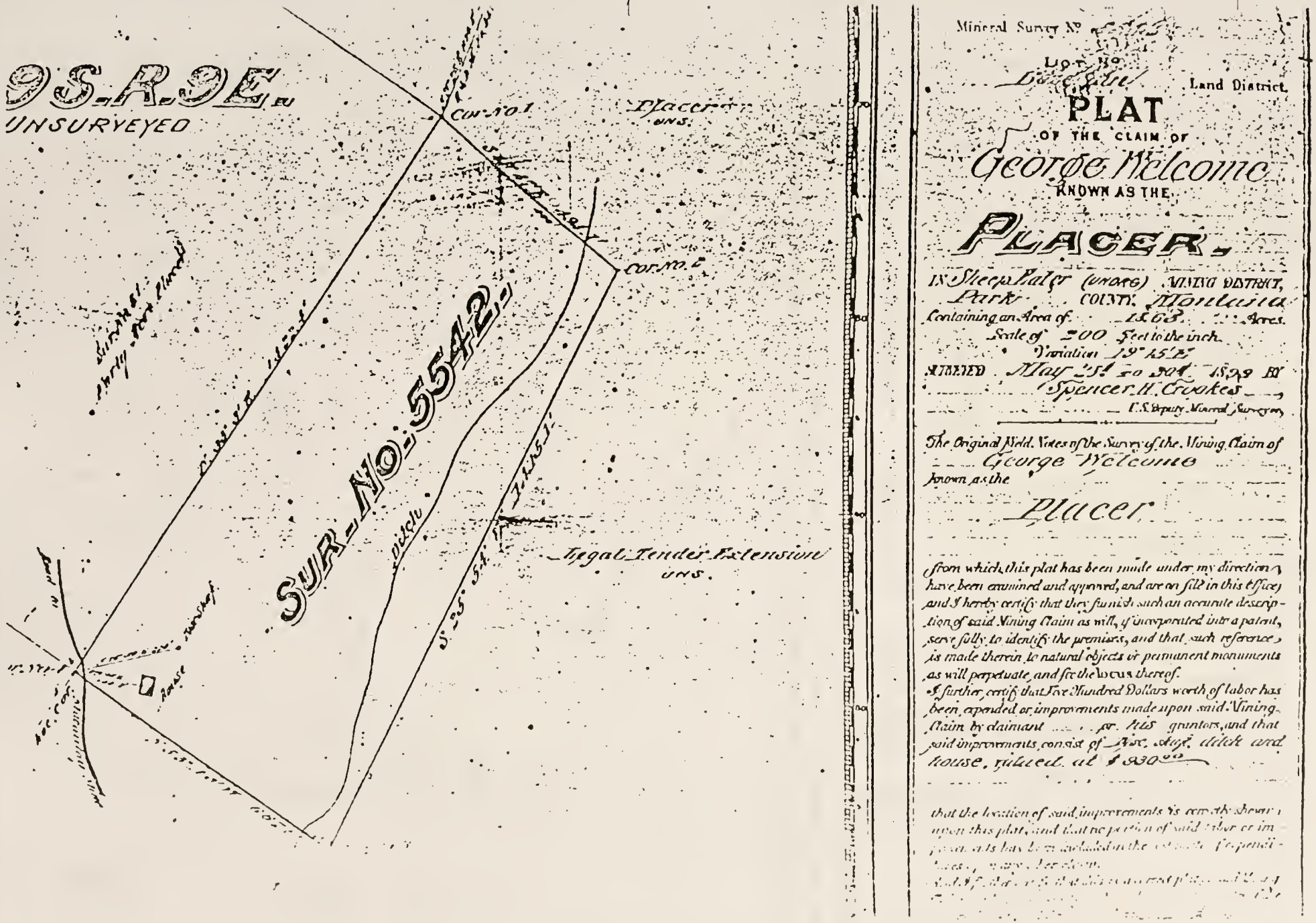
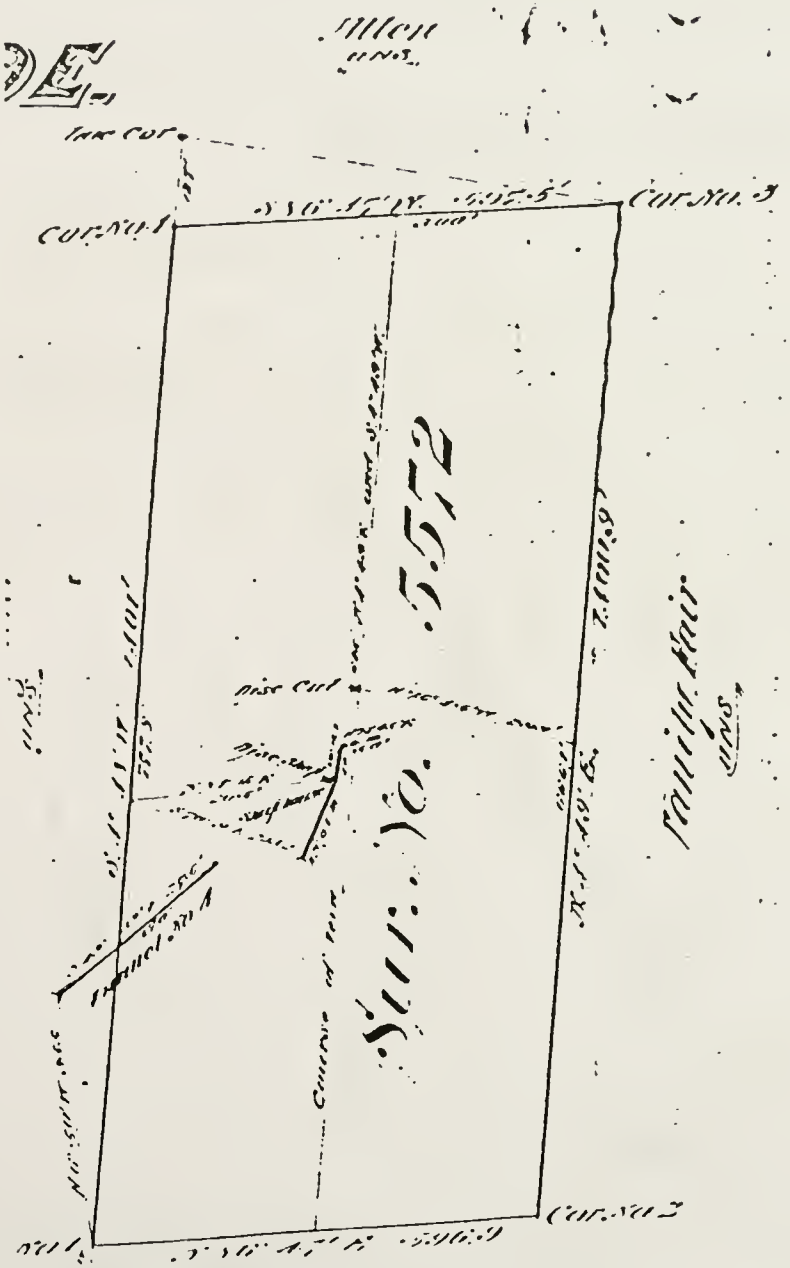


Figure 1-10. Mineral Survey Plat of the George Welcome Placer (MSN 5542). Source: Gardiner Ranger District, United States Forest Service.



Mineral Survey No. 5572

Lot No.

Land District.

PLAT

OF THE CLAIM OF

George H. Phelps & Albert Yeager

KNOWN AS THE

EMPIRE STATE LODE

In Sheperdier (mining) Mining District,
York County, Montana
Containing an Area of 19.012 Acres.
Scale of 2000 Feet to the inch.
Variation 19° 30' East
SURVEYED August 25th, 1900 BY
Charles A. Ingersoll,
U.S. Deputy Mineral Surveyor.

The Original Field Notes of the Survey of the Mining Claim of George H. Phelps & Albert Yeager known as the

Empire State Lode

from which this plat has been made under my direction, have been examined and approved, and are on file in this office; and I hereby certify that they furnish such an accurate description of said Mining Claim as will, if incorporated into a patent, serve fully to identify the premises, and that such reference is made therein to natural objects or permanent monuments as will perpetuate and fix the locus thereof.

I further certify that Five Hundred Dollars worth of labor has been expended or improvements made upon said Mining Claim by claimant & or their grantors, and that said improvements consist of Drift, crosscut, shaft, four tunnels and shaft house, valued at $2500.00

that the location of said improvements is correctly shown upon this plat and that no portion of said

Figure 1-11. Mineral Survey Plat of the Empire State Lode (MSN 5572). Source: Gardiner District, United States Forest Service.

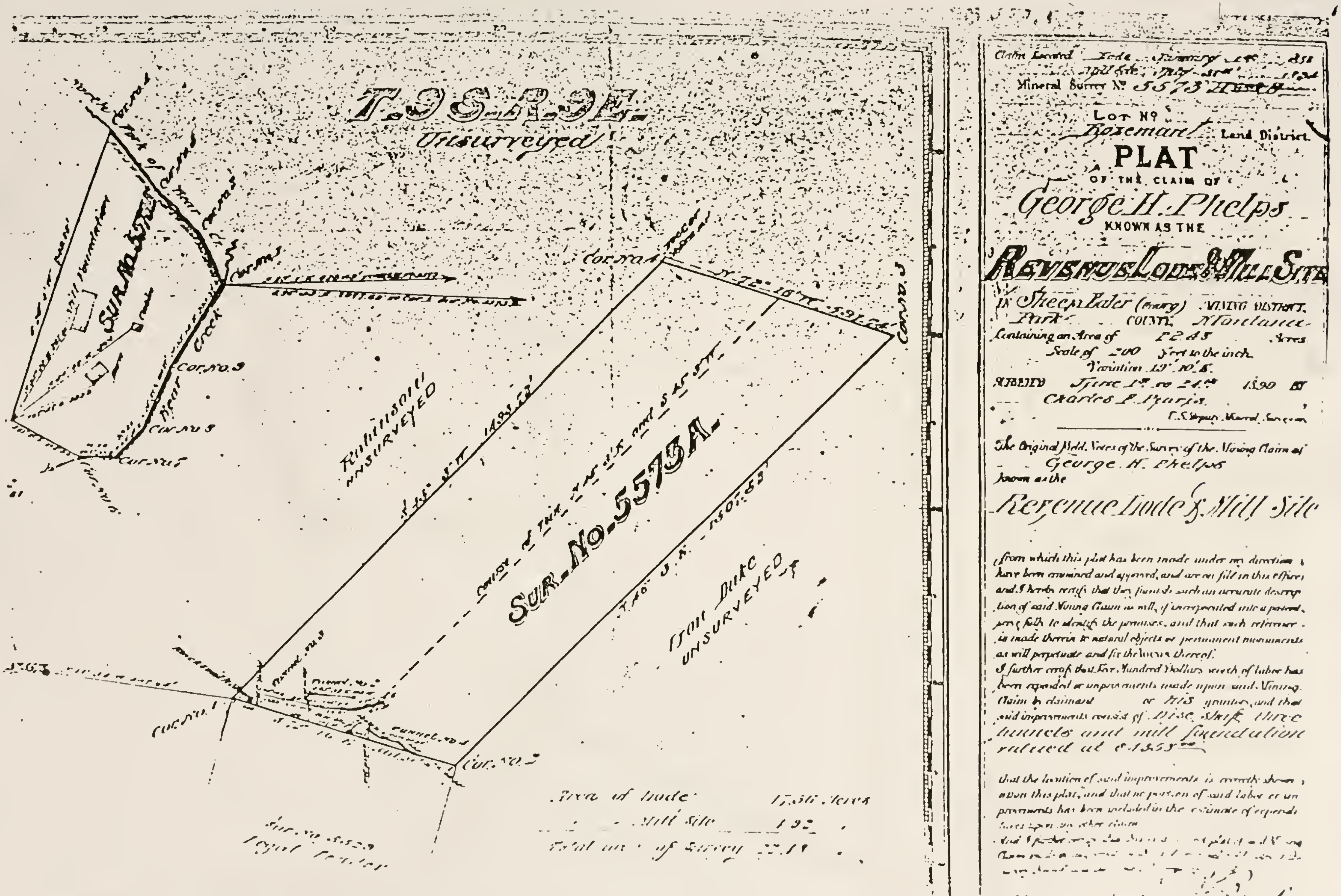


Figure 1-12. Mineral Survey Plat of the Revenue Lode Mill Site (MSN 5573A & B) Source: Gardiner Ranger District, United States Forest Service.

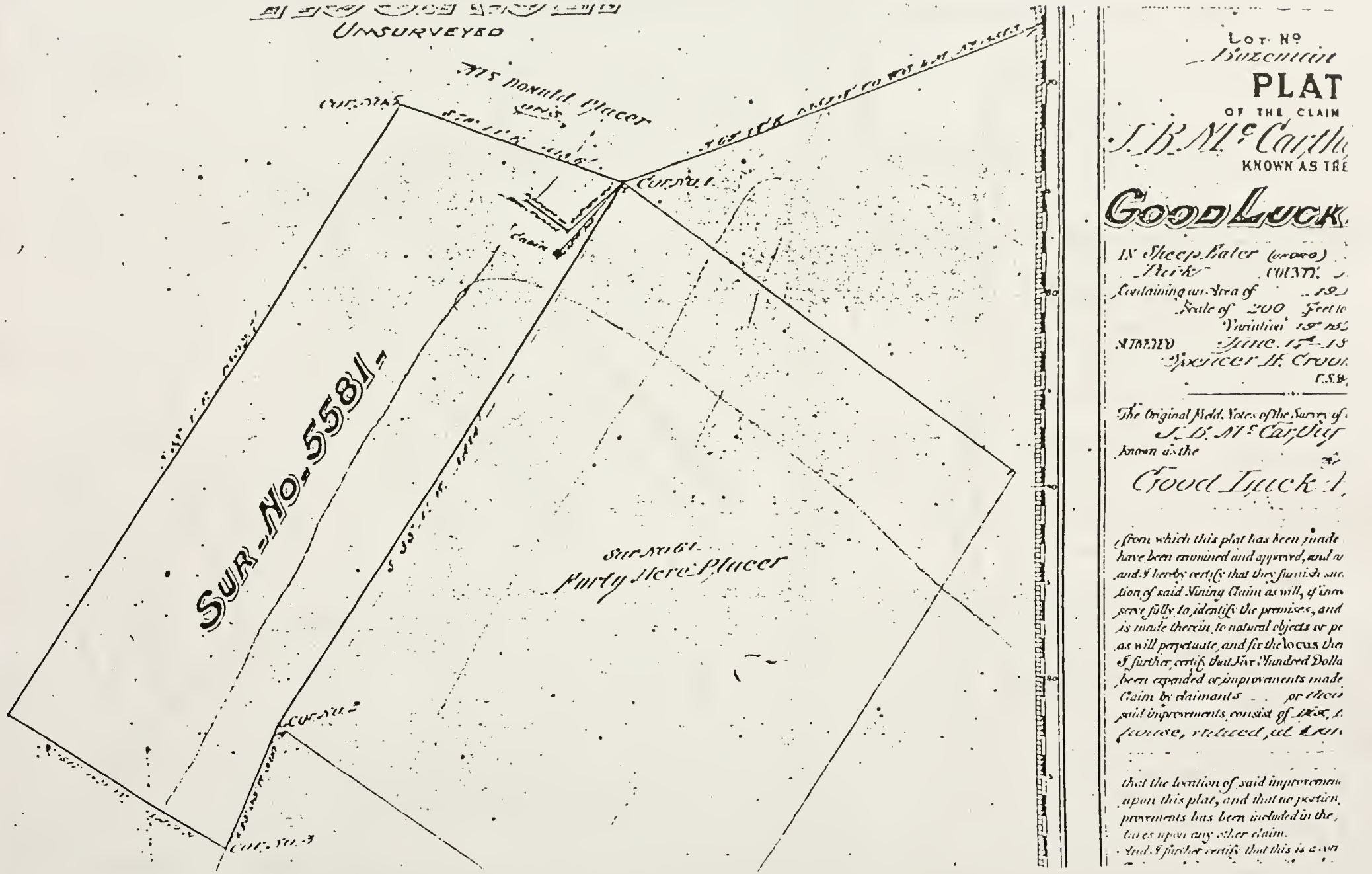


Figure 1-13. Mineral Survey Plat of the Good Luck Placer claim (MSN 5581). Source: Gardiner Ranger District, United States Forest Service.

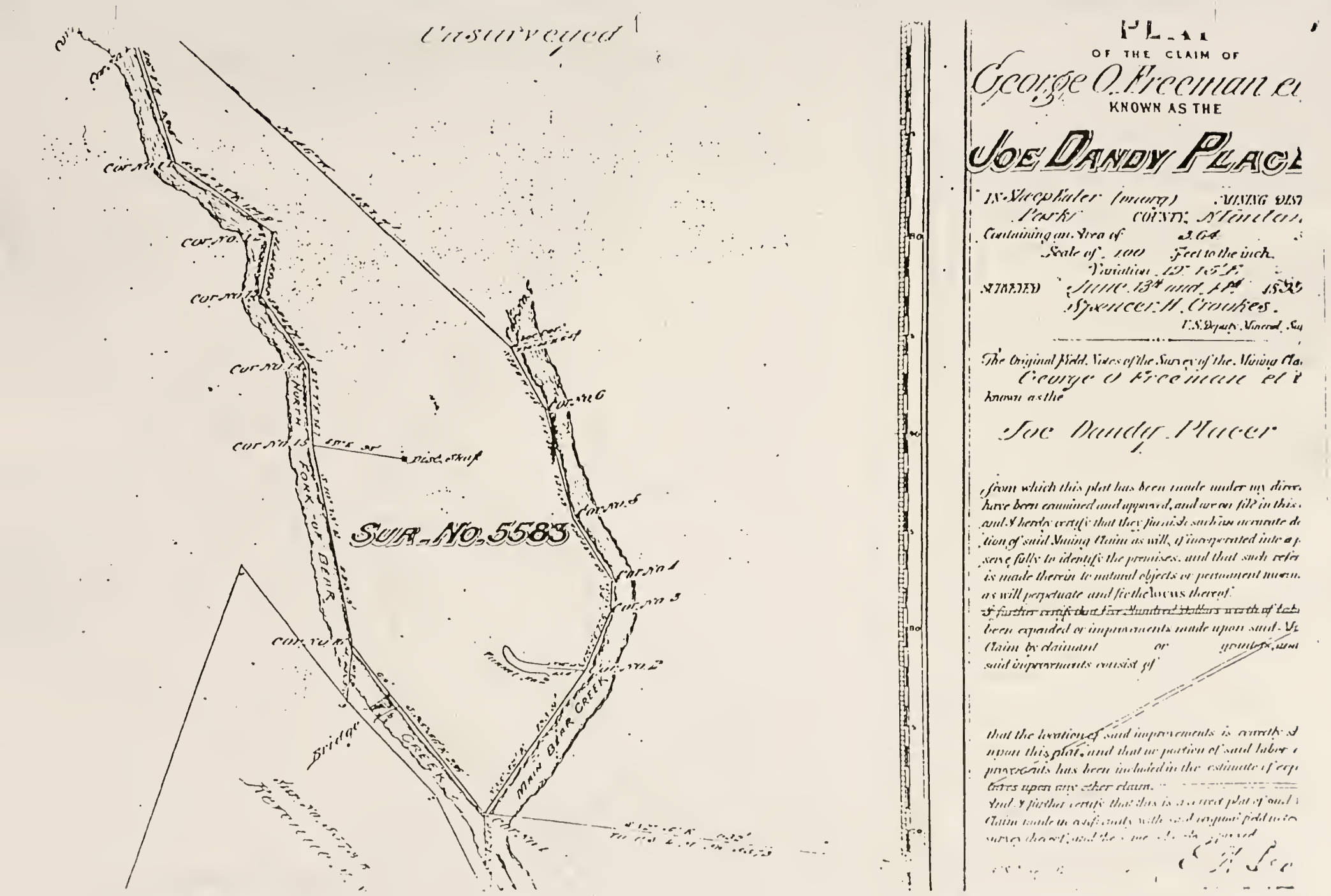


Figure 1-14. Mineral Survey Plat of the Joe Dandy Placer (MSN 5583). Source: Gardiner Ranger District, United States Forest Service.

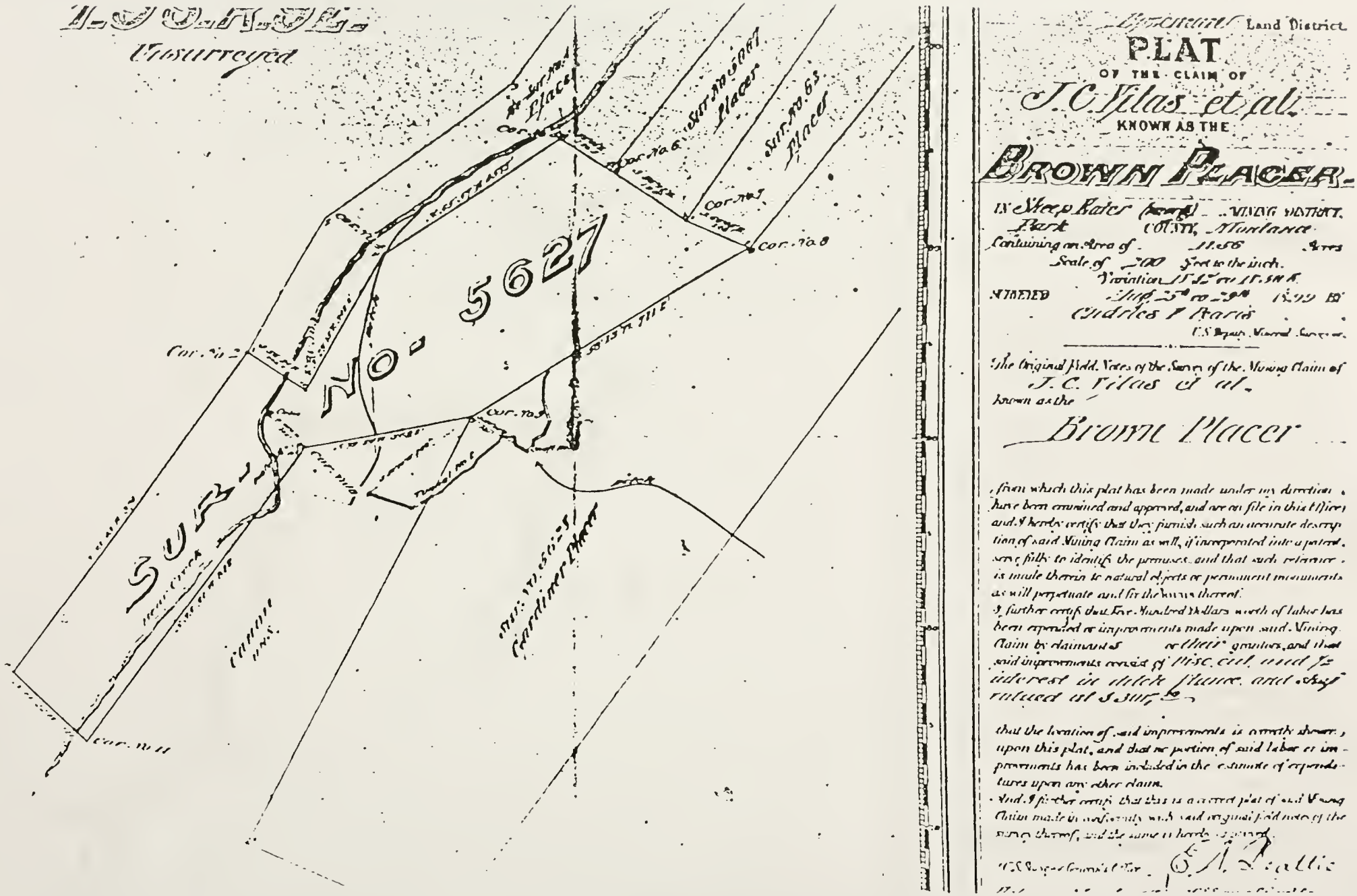


Figure 1-15. Mineral Survey Plat of the Brown Placer (MSN 5627) Source: Gardiner Ranger District, United States Forest Service.

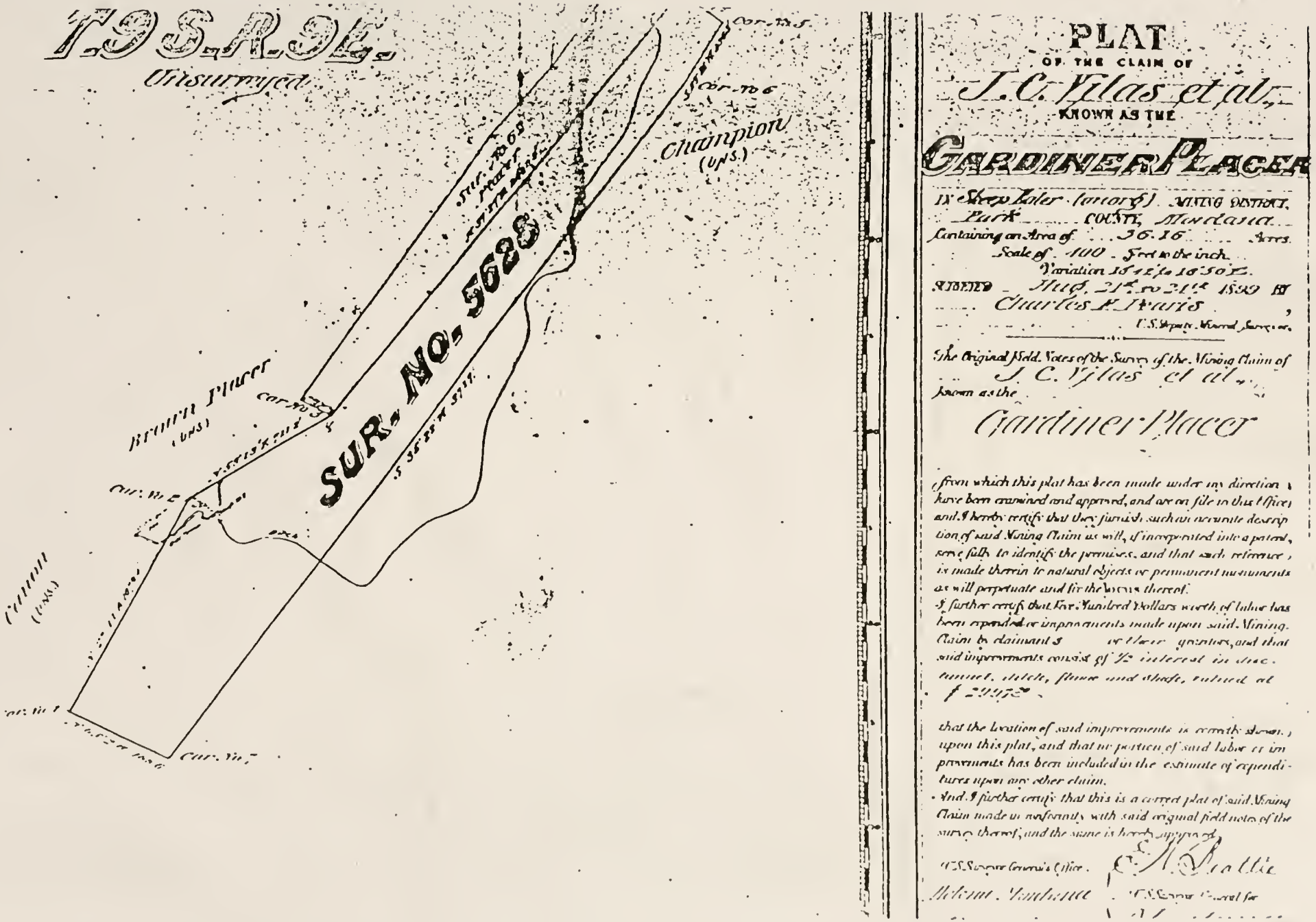


Figure 1-16. Mineral Survey Plat of the Gardiner Placer claim (MSN 5628). Source: Gardiner Ranger District, United States Forest Service.

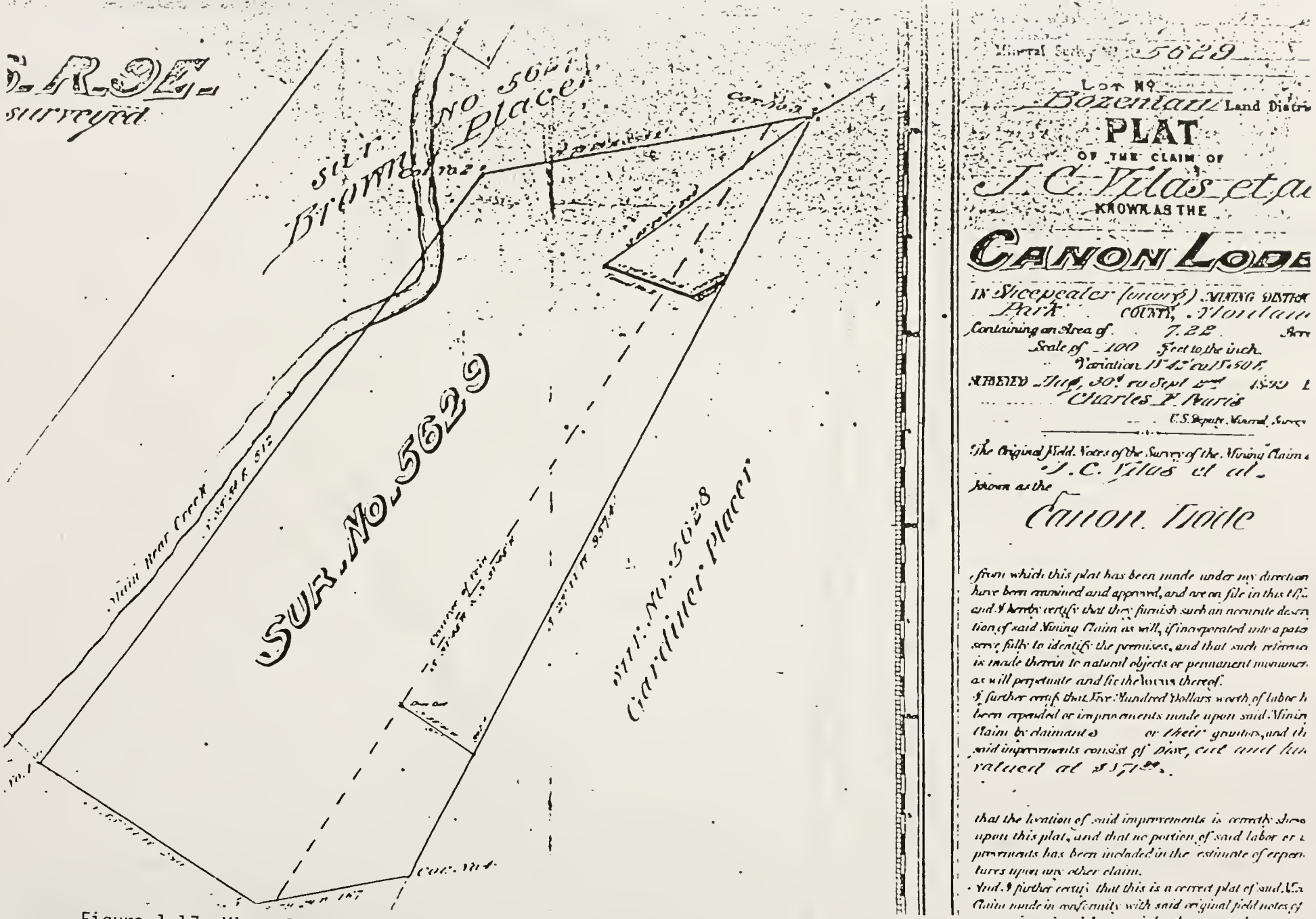


Figure 1-17. Mineral Survey Plat of the Canyon Lode (MSN 5629). Source: Gardiner Ranger District, United States Forest Service.

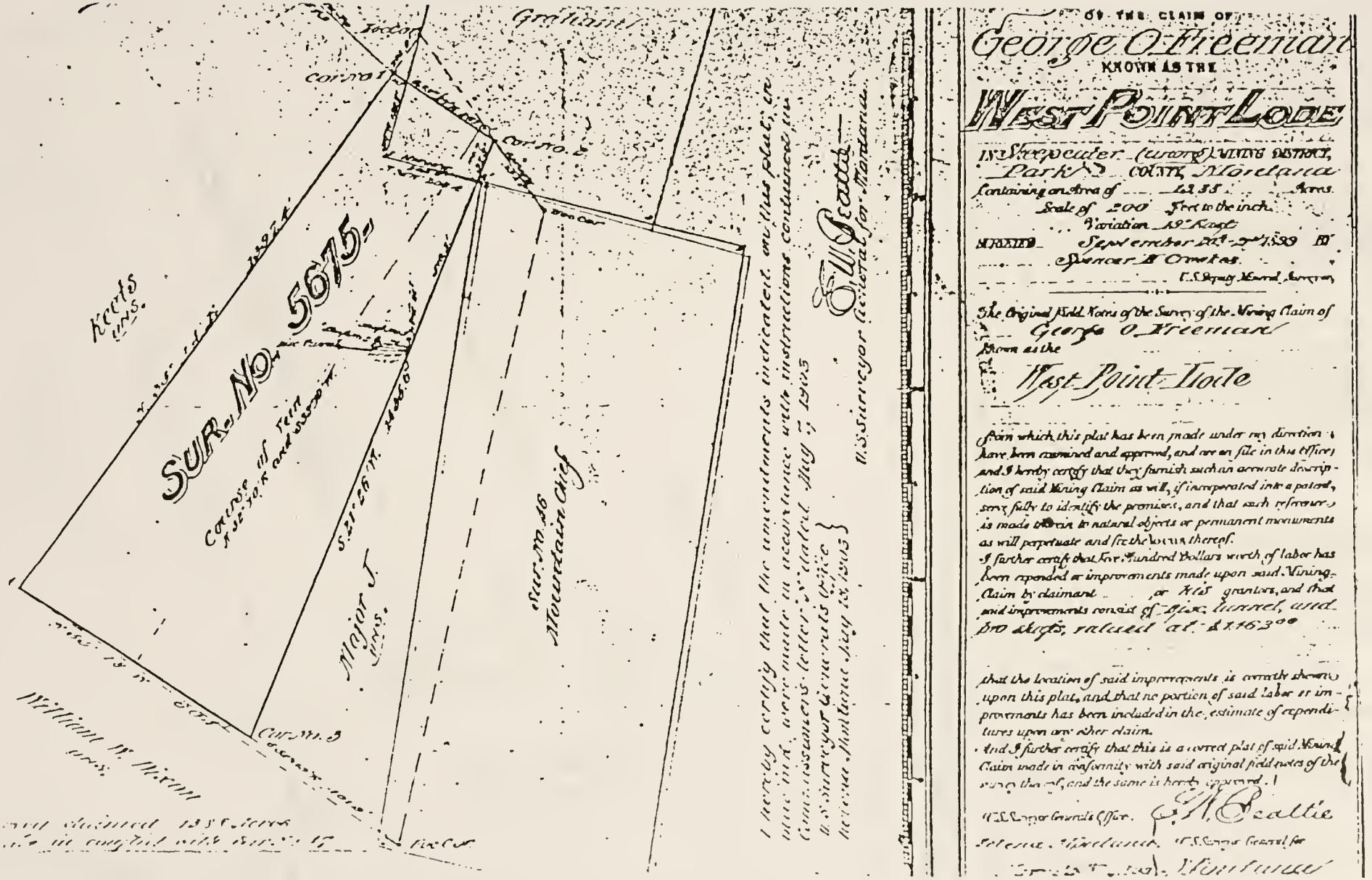


Figure 1-18. Mineral Survey Plat of the West Point Lode (MSN 5675. Source: Gardiner Ranger District, United States Forest Service.

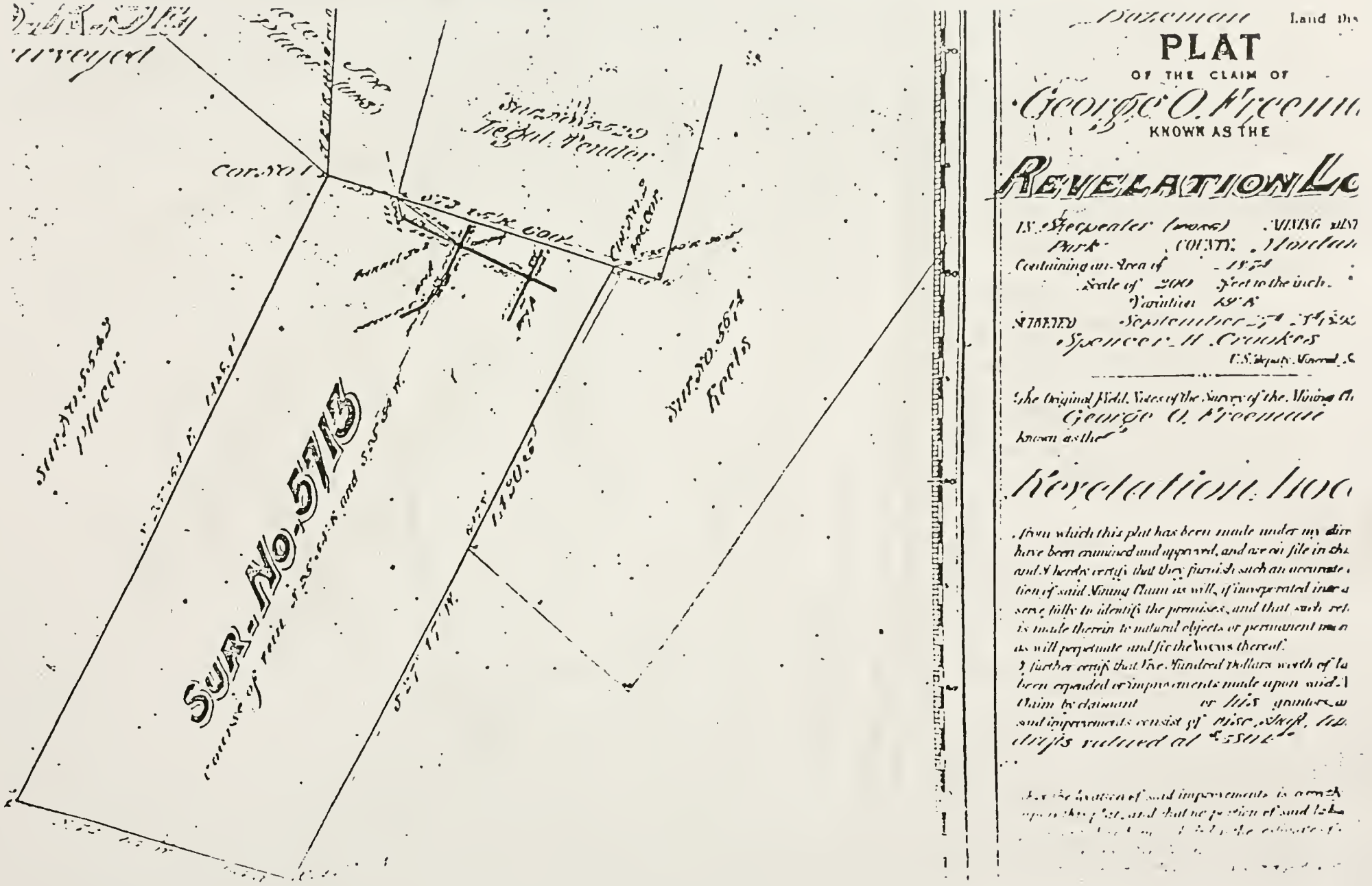


Figure 1-19. Mineral Survey Plat of the Revelation Lode (MSN 5713). Source: Gardiner Ranger District, United States Forest Service.

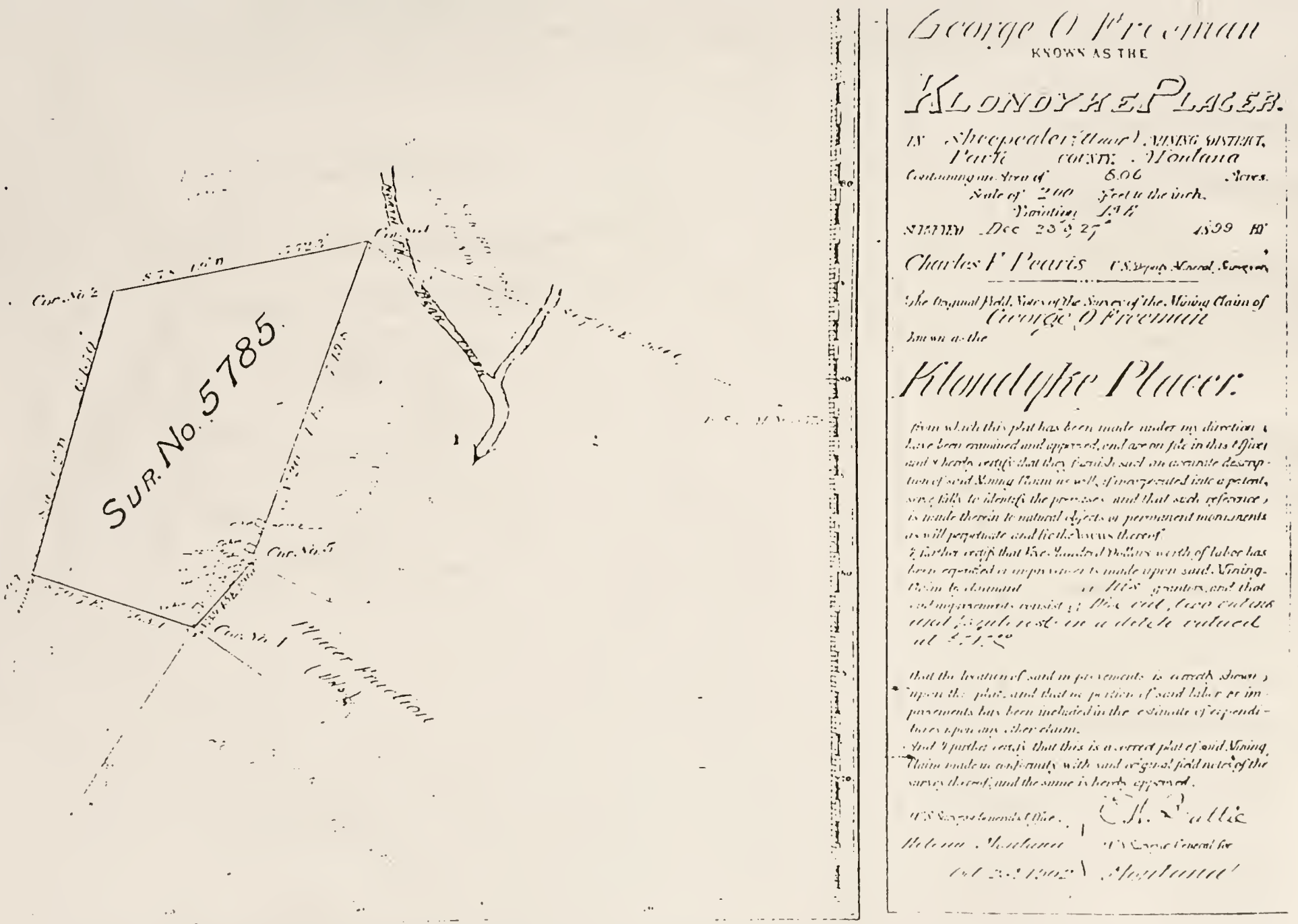


Figure 1-20. Mineral Survey Plat of the Klondyke Placer claim (MSN 5785). Source: Gardiner Ranger District, United States Forest Service.

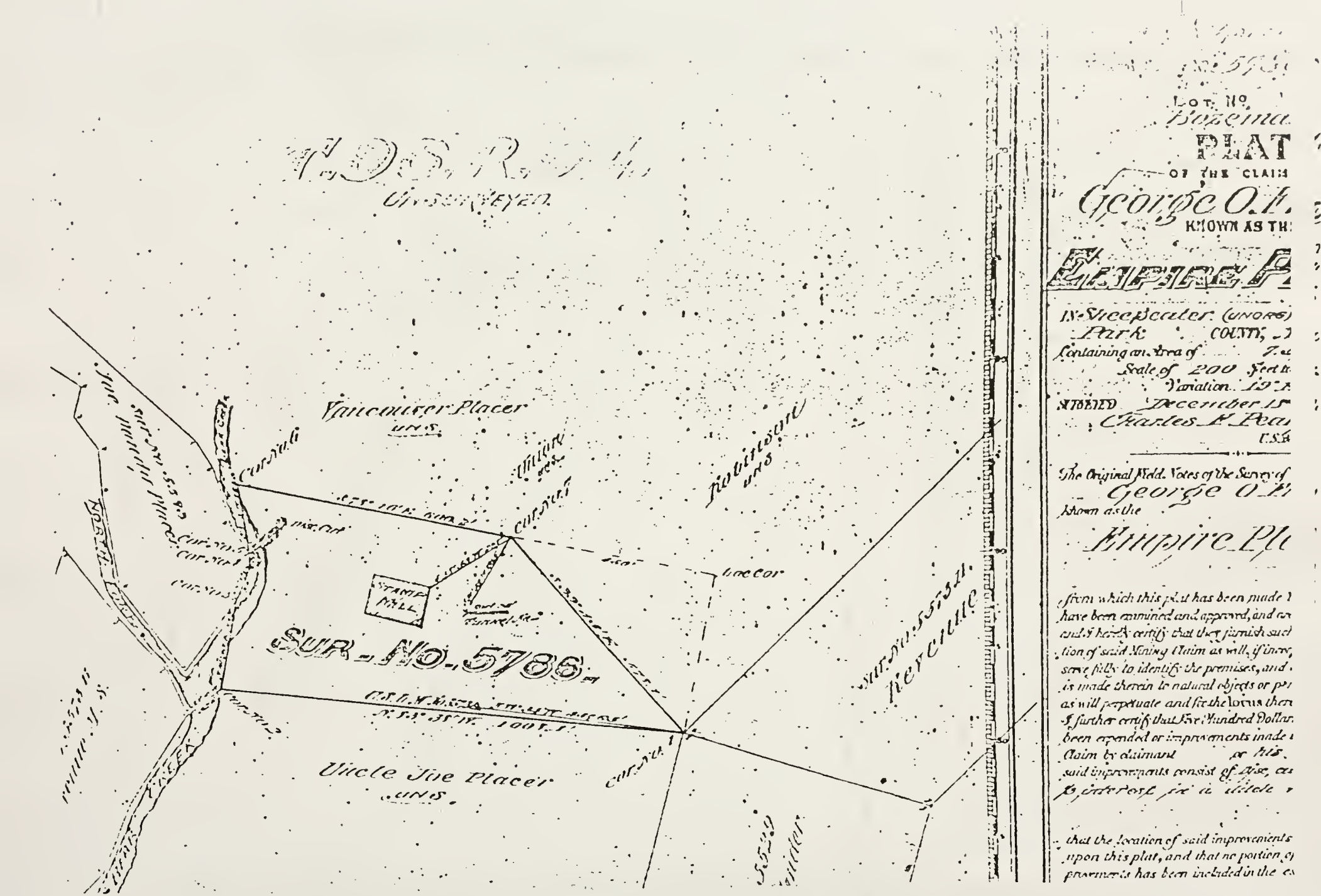


Figure 1-21. Mineral Survey Plat of the Empire Placer claim (MSN 5786). Source: Gardiner Ranger District, United States Forest Service.

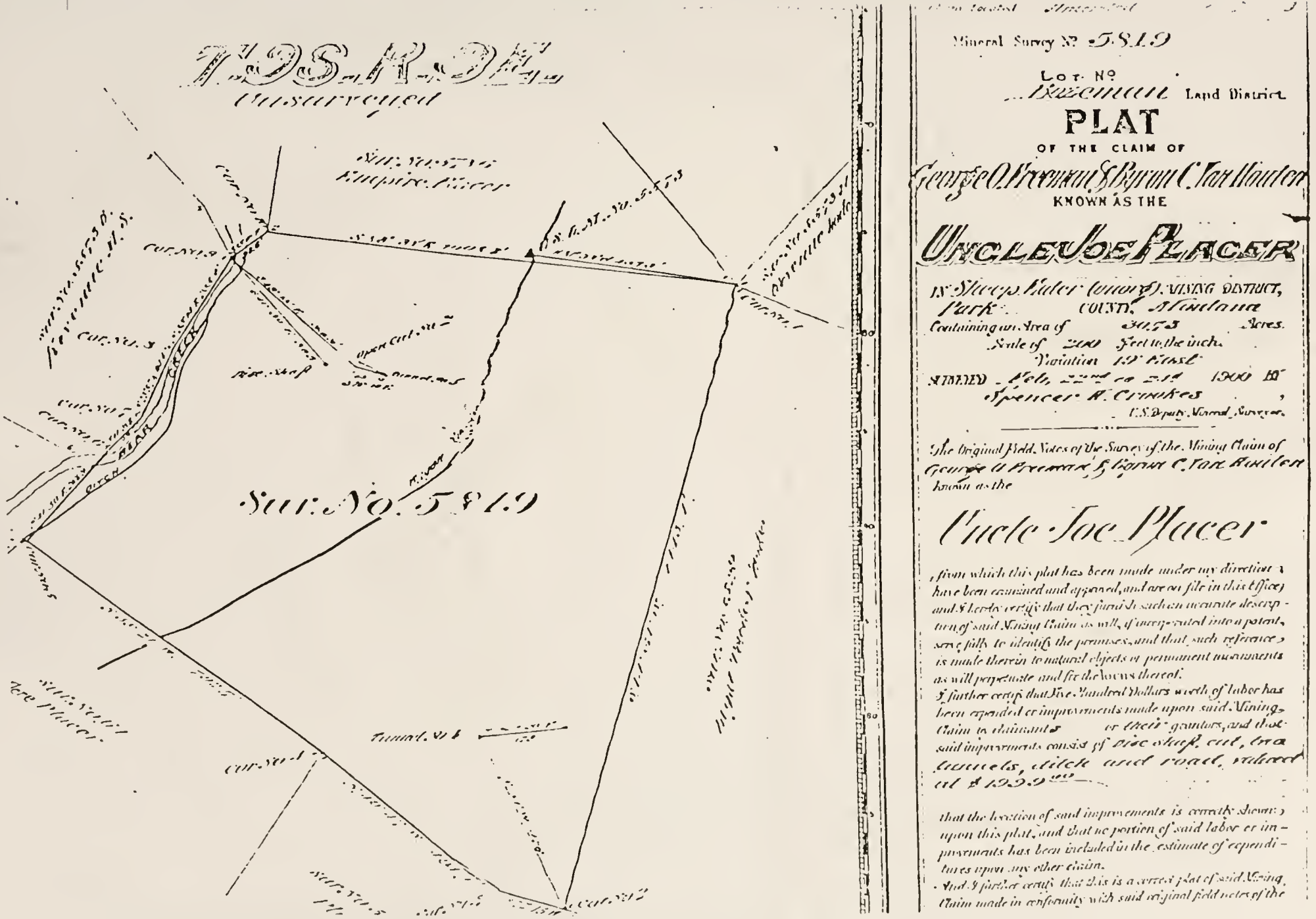


Figure 1-22. Mineral Survey Plat of the Uncle Joe Placer claim (MSN 5819). Source: Gardiner Ranger District, United States Forest Service.

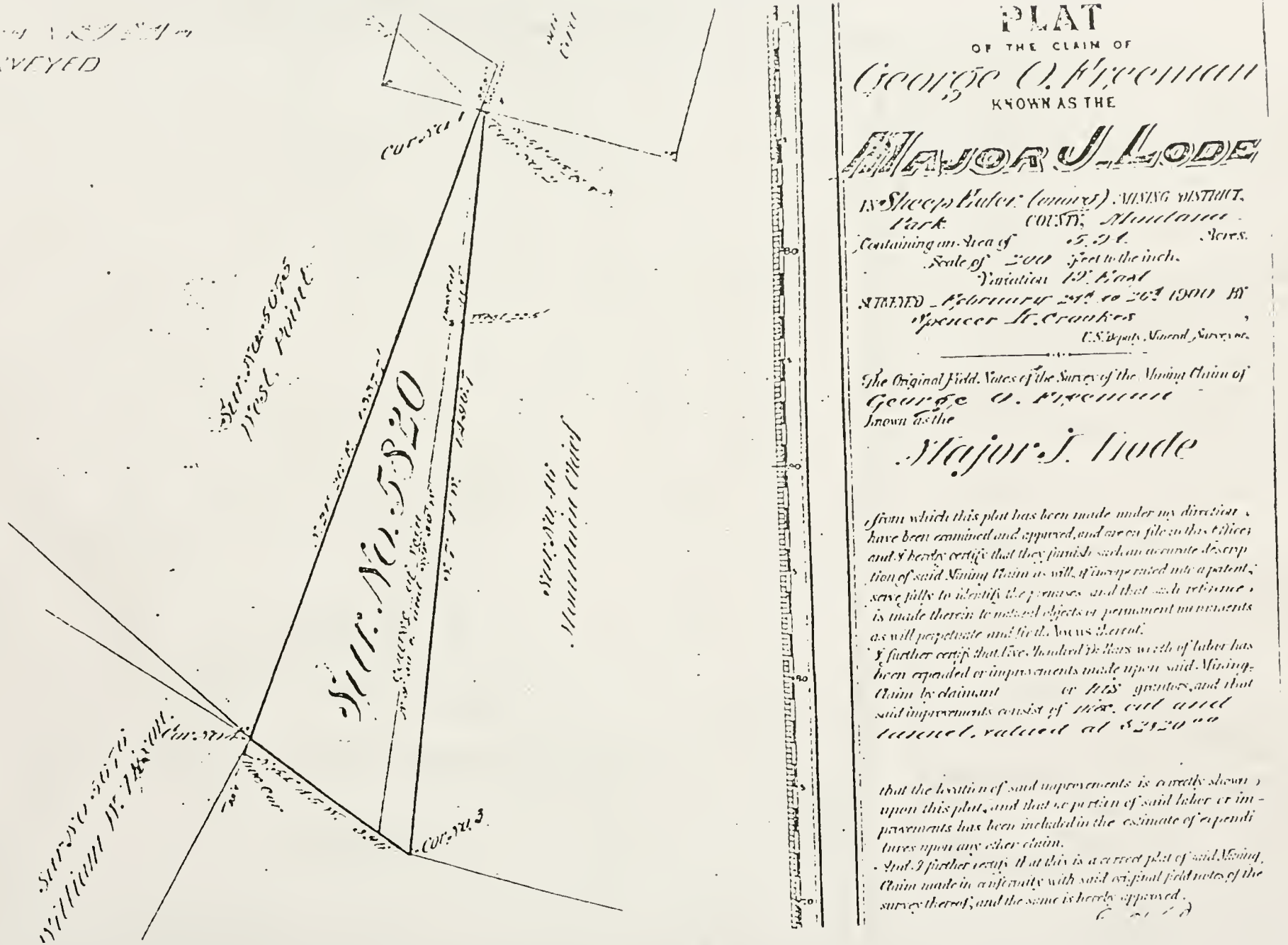


Figure 1-23. Mineral Survey Plat of the Major J. Lode (MSN 5820). Source: Gardiner Ranger District, United States Forest Service.

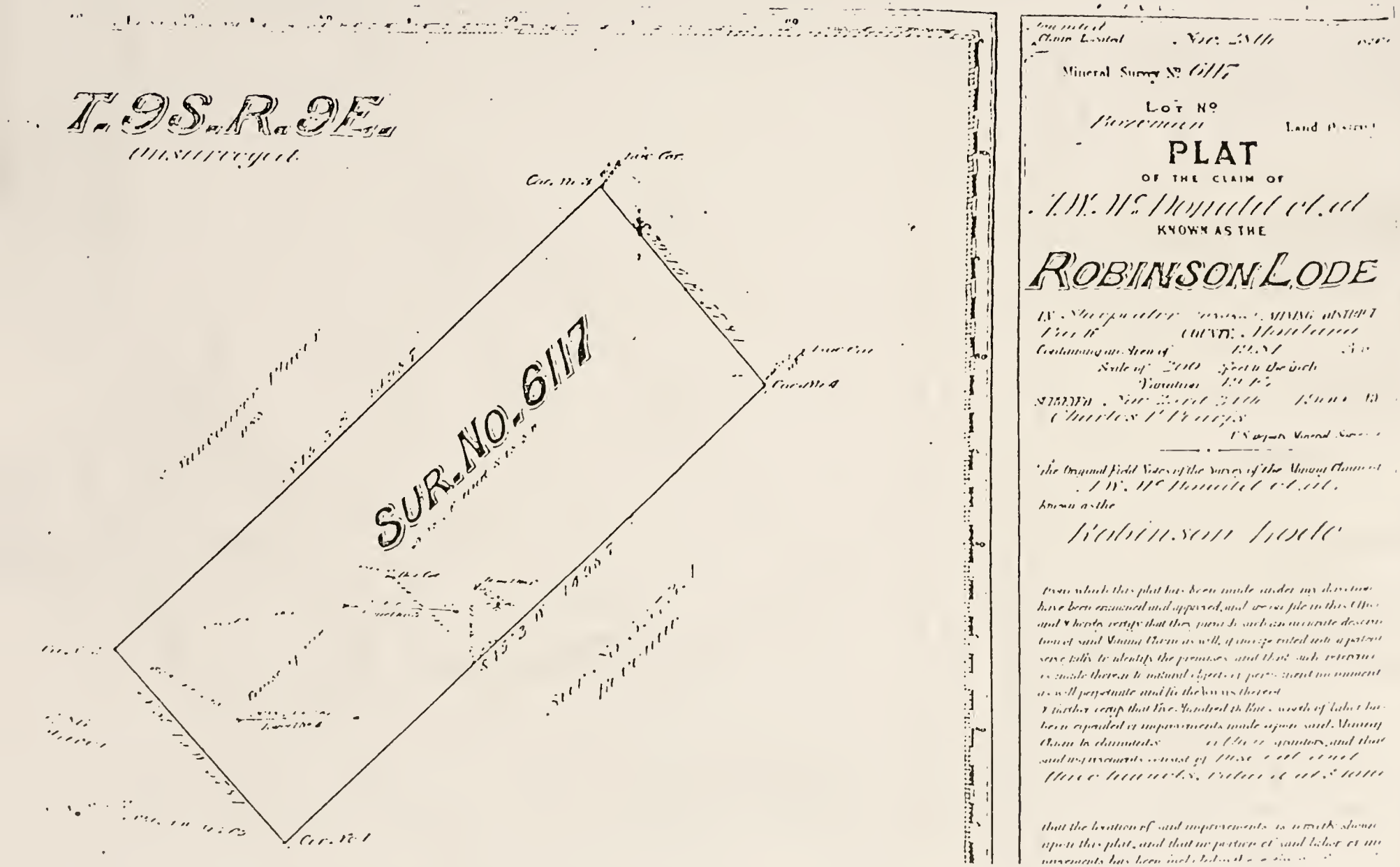


Figure 1-24. Mineral Survey Plat of the Robinson Lode (MSN 6117). Source: Gardiner Ranger District, United States Forest Service.

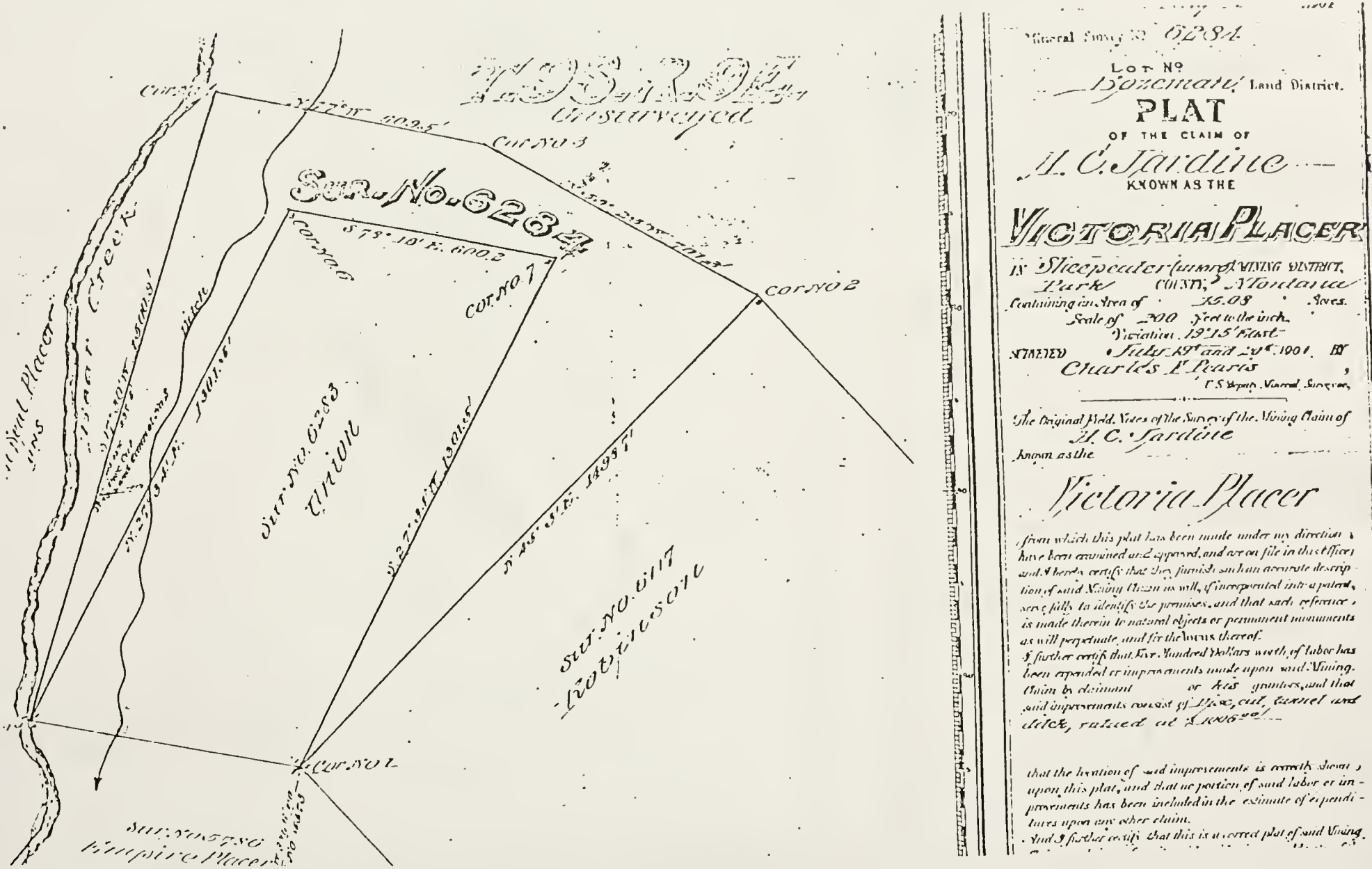


Figure 1-25. Mineral Survey Plat of the Victoria Placer claim (MSN 6284). Source: Gardiner Ranger District, United States Forest Service.

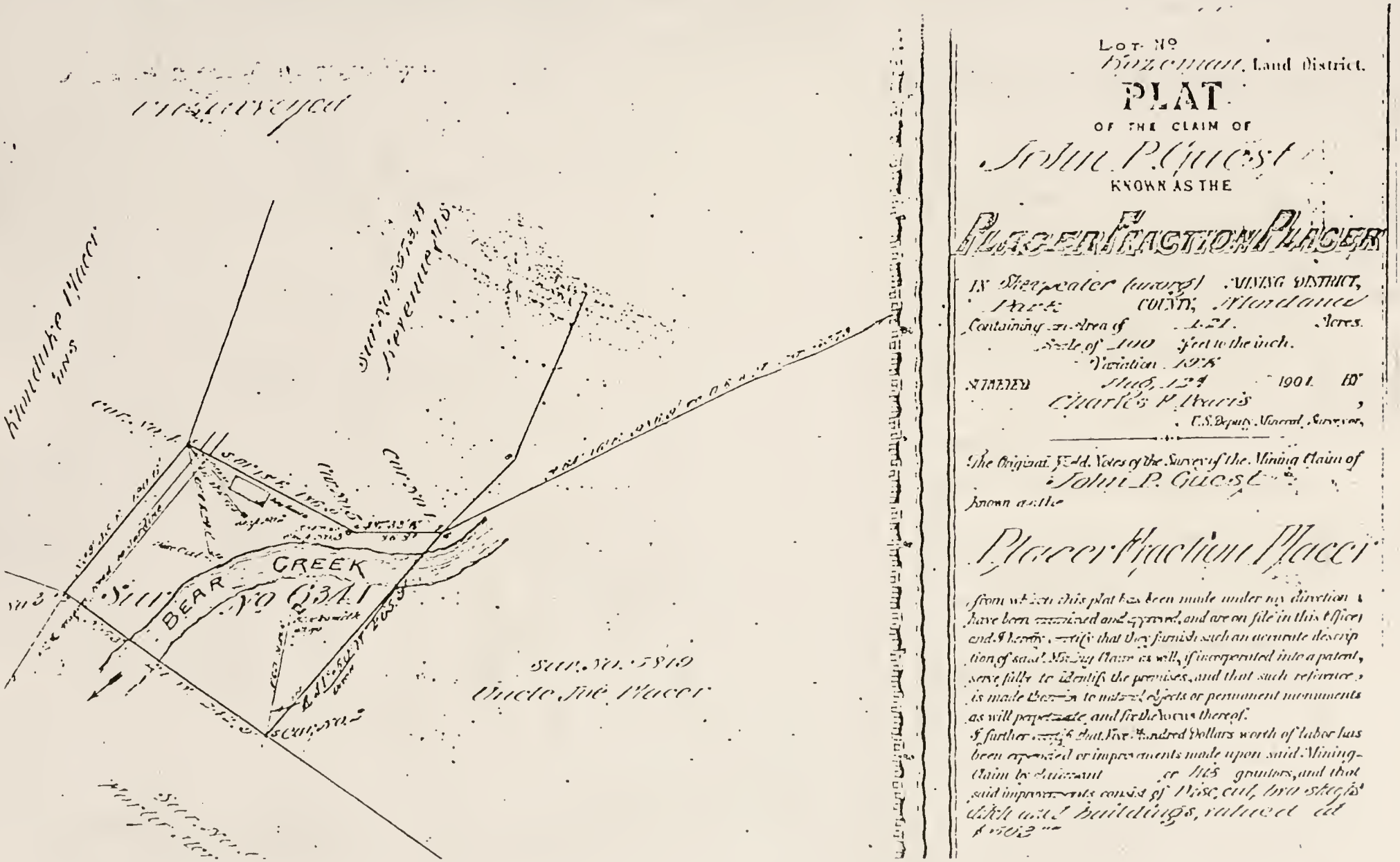


Figure 1-26. Mineral Survey Plat of the Placer Fraction Placer claim (MSN 6341). Source: Gardiner Ranger District, United States Forest Service.

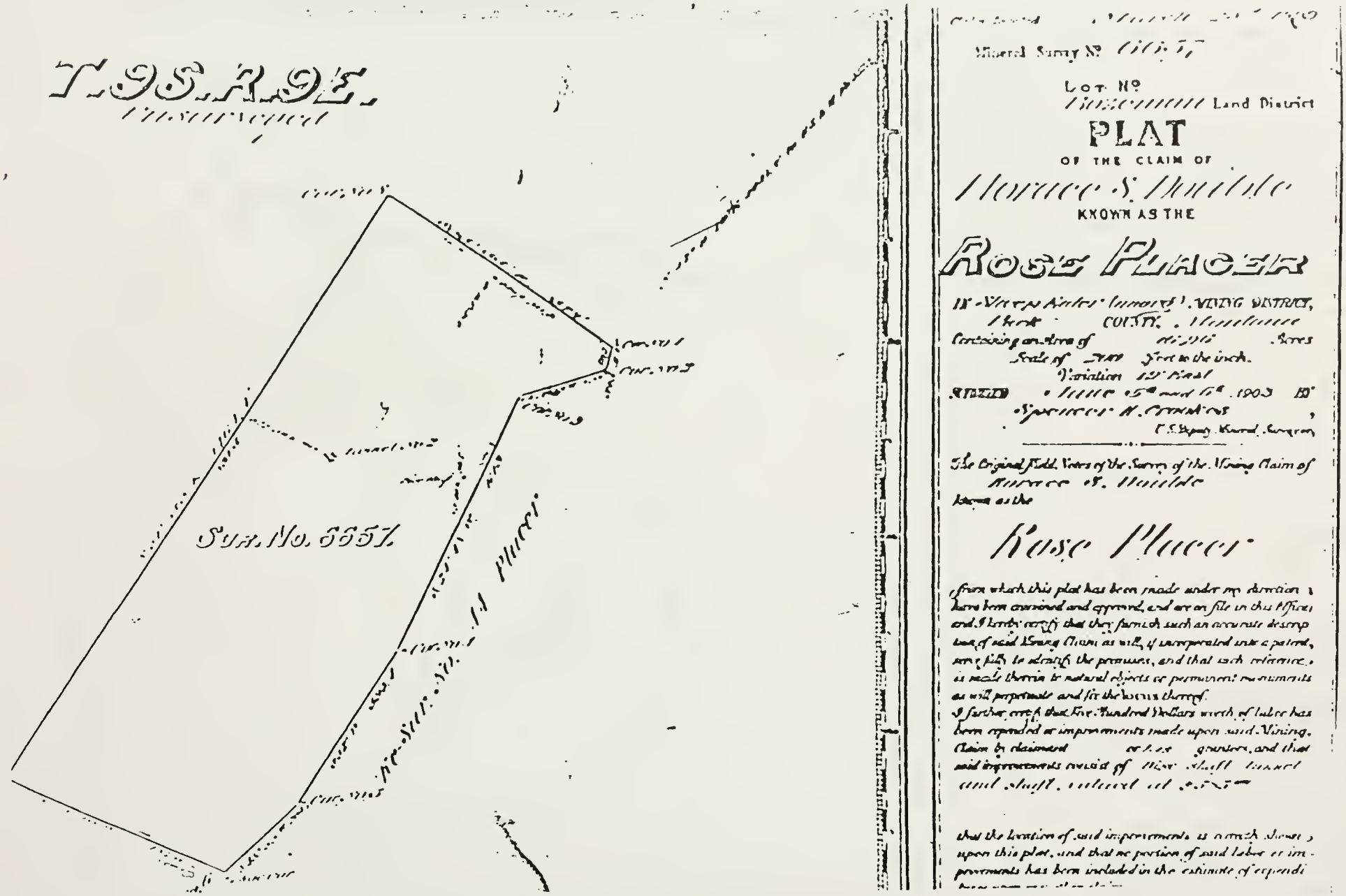


Figure 1-27. Mineral Survey Plat of the Rose Placer claim(MSN 6657). Source: Gardiner Ranger District, United States Forest Service.

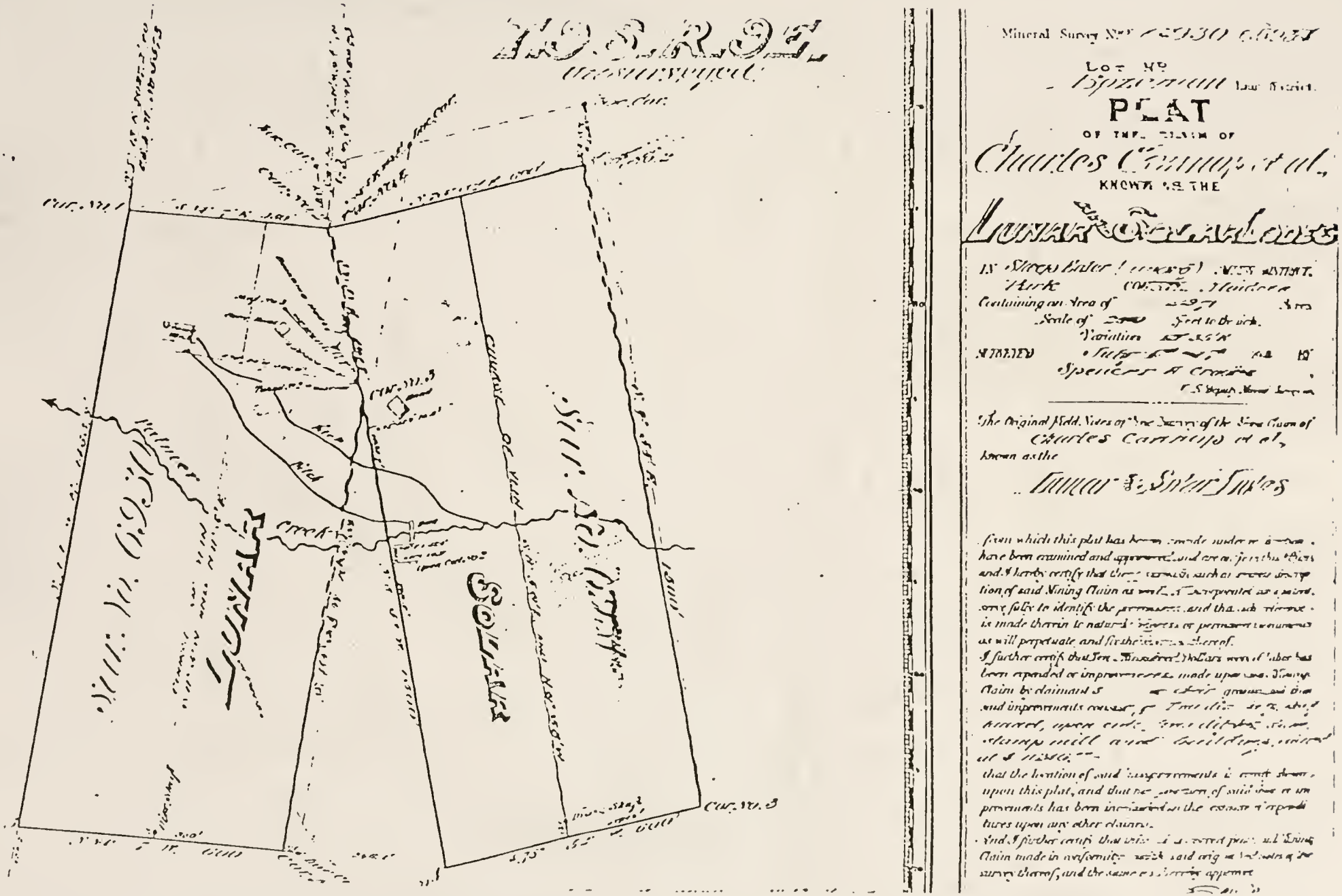


Figure 1-28. Mineral Survey Plat of the Lunar & Solar Lodes (MSN 6930 & 6931). Source: Gardiner Ranger District, United States Forest Service.

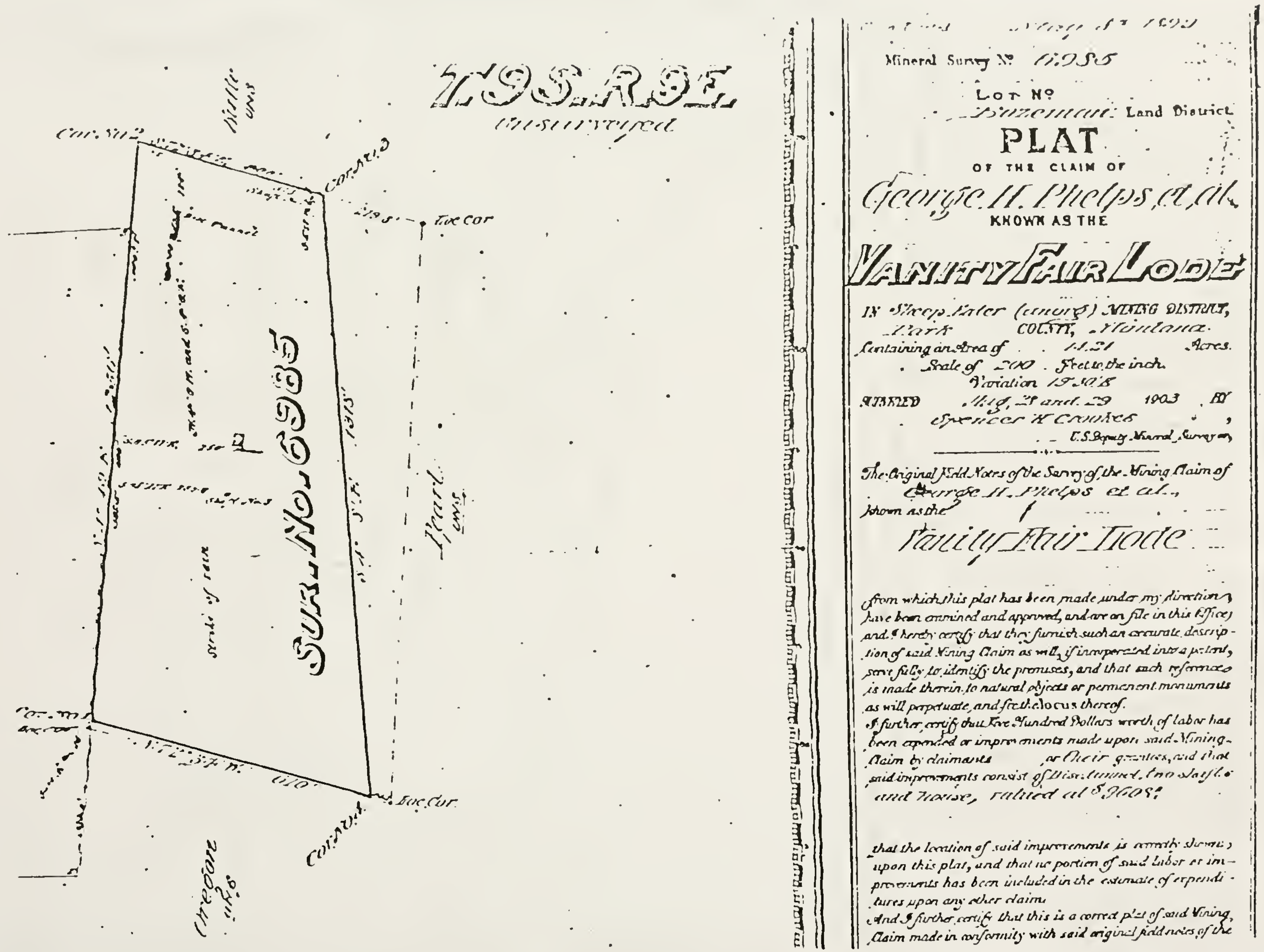


Figure 1-29. Mineral Survey Plat of the Vanity Fair Lode (MSN 6985). Source: Gardiner Ranger District, United States Forest Service.

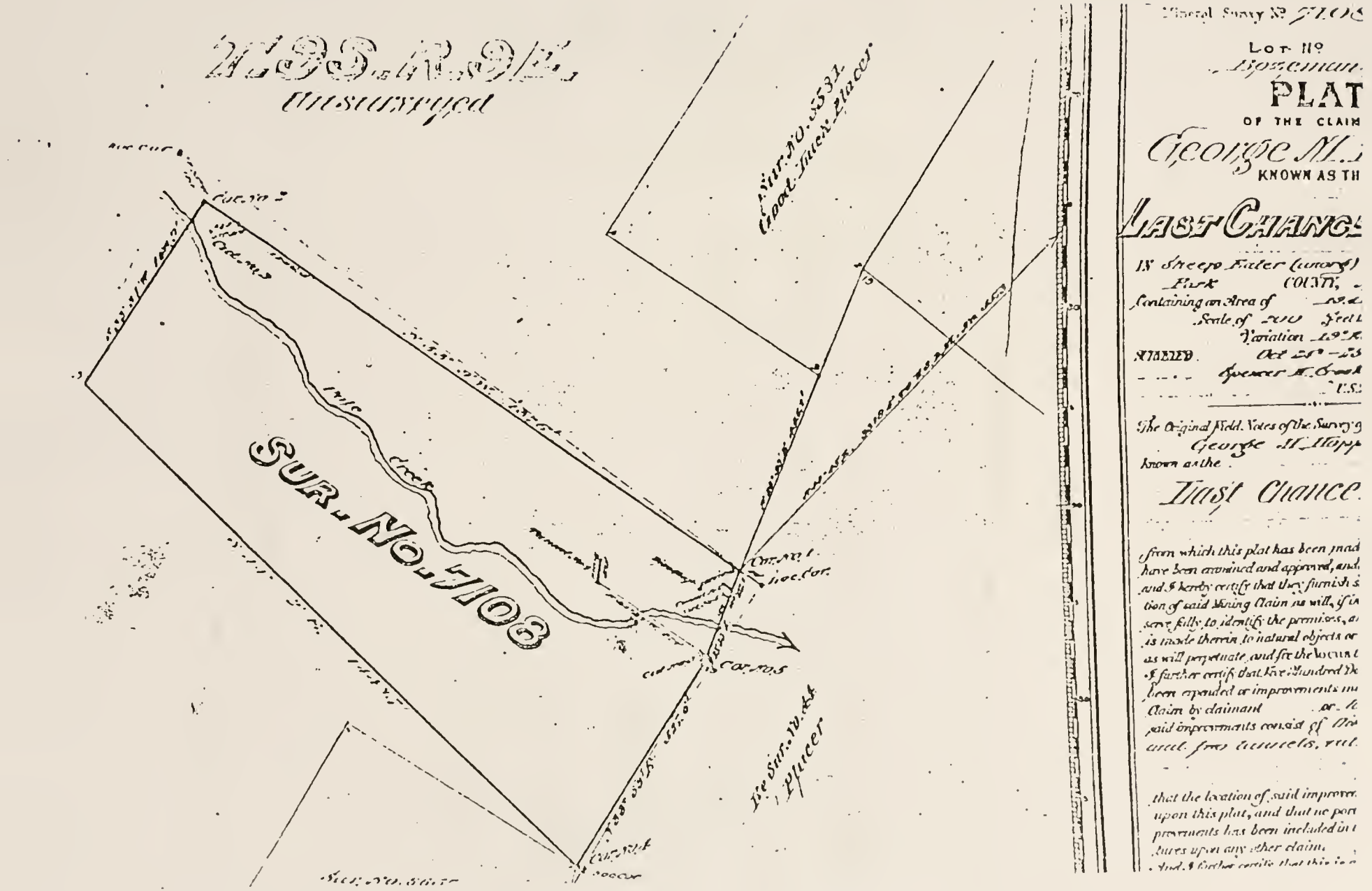


Figure 1-30. Mineral Survey Plat of the Last Chance Placer (MSN 7108). Source: Gardiner Ranger District, United States Forest Service.

Appendix 2.

Flow Sheets for the Revenue Mill

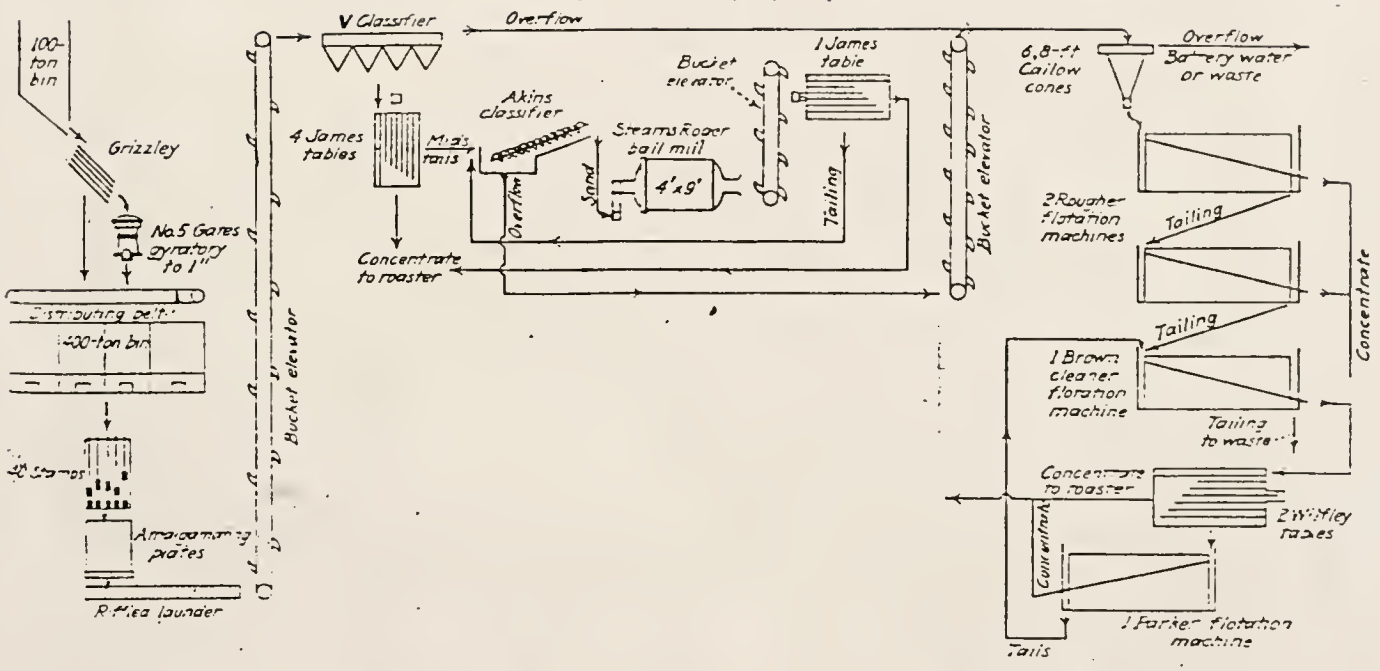


Figure 2-1. Flow Sheet Showing the More Important Units of Equipment in the Revenue Mill.
(E.H. Robie, Mining Journal Press, November 14,1925,p. 769.)

Appendix 3.

GLO Survey Plat Map for Jardine Area

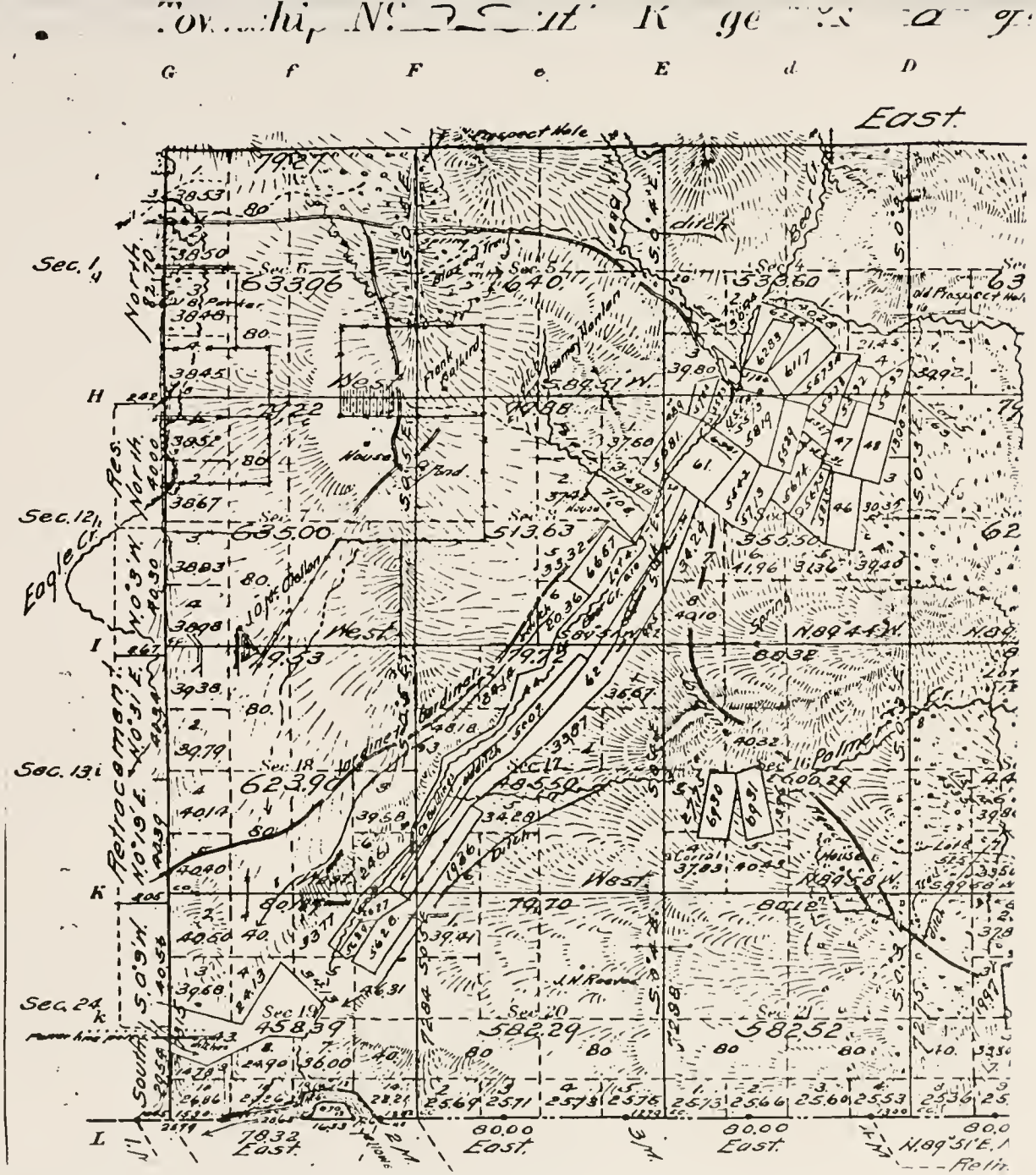


Figure 3-1. GLO Plat Map of Jardine Area (T9S, R9E)
Source: Gardiner Ranger District, United States Forest Service.

APPENDIX 4

The National Register of Historic Places

APPENDIX 4

Two sites located in this cultural resource inventory have been recommended as eligible for the National Register of Historic Places. The Johnson Family site (24PA159) is an archeological site and the Jardine site (24PA339) is an historic site.

The next step in this procedure is to request a determination of eligibility for the two sites. This is done by completing a National Register Nomination form and submitting it to the Advisory Council through the Montana State Historic Preservation Office. If both sites are determined eligible, then the effect of the mining project must be determined on each eligible site. This is done by applying the criteria in 36 CFR 800.3. Direct and indirect effects must be considered.

If there is no effect or if the effect is not adverse, no further work at the site is warranted. No mitigative work is necessary if there are not adverse effects to mitigate. If, however, there are adverse impacts to a National Register eligible site then recommendations to mitigate adverse effects must be made. In the case of an archeological site this often may involve excavation of portions of a site to recover significant information. In the case of an historic site this may include avoidance of adverse impact or further research and recording. Mitigation plans should be aimed at reducing or eliminating impacts to those qualities which make the site eligible for the National Register.

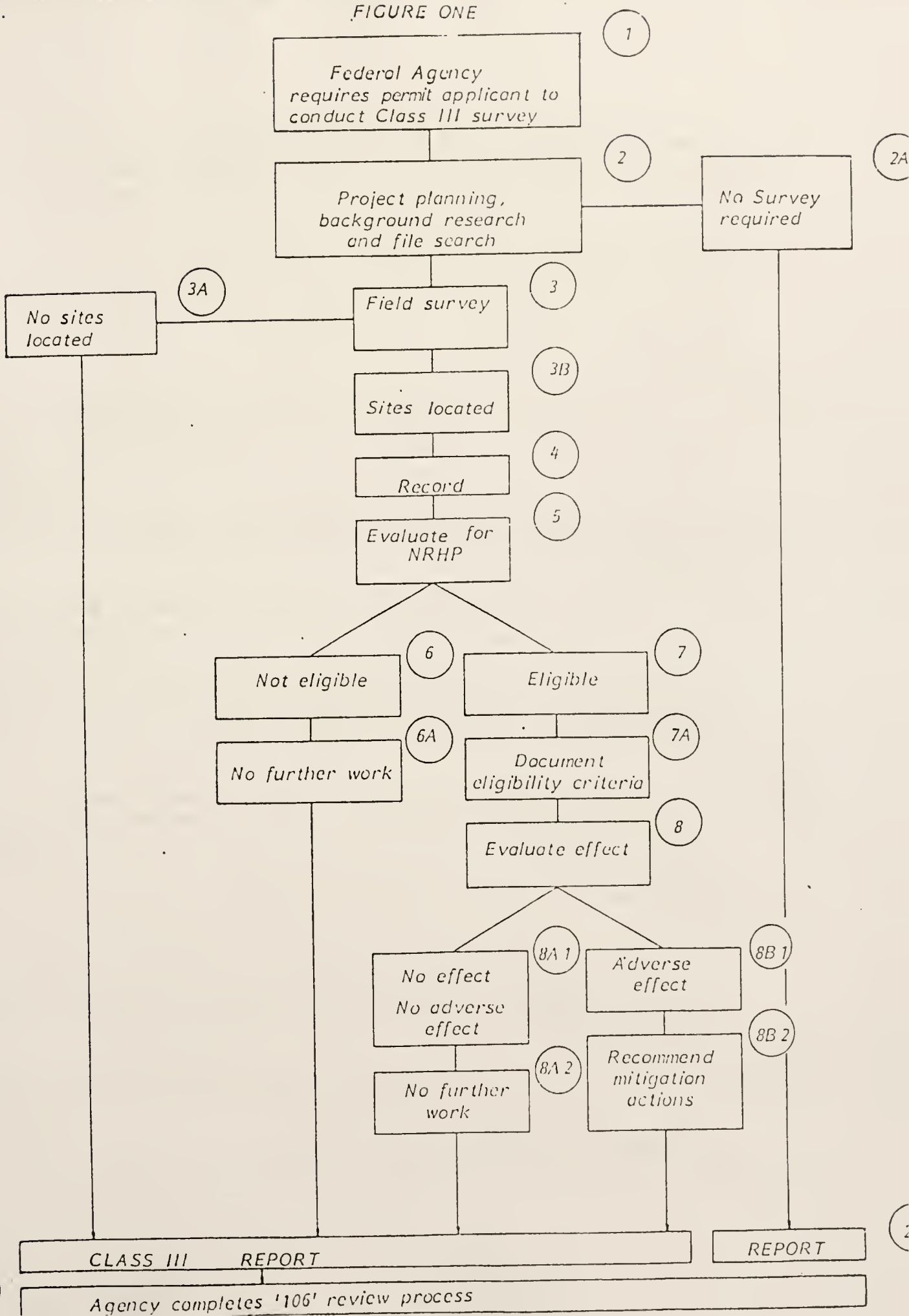
In the case of the Johnson Family site (24PA159) it appears that there will be no effect since the site is not located in a primary mining impact area. In the case of the Jardine site (24PA339), which is recommended eligible for the National Register as an historic district, there may be an adverse effect which will have to be avoided if possible. If avoidance or preservation of structures that comprise the historic district is not feasible or cost effective then data recovery in the form of additional historical research, perspective corrected photographs and measured architectural drawings may be required.

INTRODUCTION

Figure 1 illustrates the step-by-step procedures involved in the field survey phase of the "106" review process. Each step is identified by a number which references a brief explanation of each step on the following pages. In each explanation, references to appropriate Federal and state laws, regulations and guidelines are provided.

The procedures outlined here relate to the field survey phase of the "106" review process only. The bibliography provides a comprehensive listing of all Federal laws and regulations relating to cultural resources. Cultural resource investigations and protective actions not mandated by the "106" process may be required by other Federal or state laws or regulations.

FIGURE ONE


1
Federal Agency requires permit applicant to conduct Class III survey
2
Project planning, background research and file search
2A
No Survey required
3A
No sites located
3
Field survey
3B
Sites located
4
Record
5
Evaluate for NRHP
6
Not eligible
6A
No further work
7
Eligible
7A
Document eligibility criteria
8
Evaluate effect
8A 1
No effect
No adverse effect
8A 2
No further work
8B 1
Adverse effect
8B 2
Recommend mitigation actions
9
CLASS III REPORT
REPORT
10
Agency completes '106' review process

1. The Federal Agency may require a permit applicant to conduct a cultural resource survey of the proposed project area. The permit applicant, in turn, hires a cultural resource consultant to perform the survey and submit a report to the applicant, the Federal agency and the SHPO. The Federal agency and SHPO use the report as the basis for National Register evaluations of sites located, determining any adverse effects on eligible sites and determining the need for any mitigation actions. (Antiquities Act of 1906/P.L. 59-209; Historic Sites Act of 1935/P.L. 74-292; Historic Preservation Act of 1966/P.L. 89-665; Amendment to Historic Preservation Act of 1966/P.L. 91-243; National Environmental Policy Act of 1969/P.L. 91-190; Archeological Conservation Act of 1974/P.L. 93-291; Executive Order 11593 of 1971; 36CFR800)

2. The cultural resource contractor plans the survey project, does background research on the project area, reviews regional overviews and other documents to familiarize himself with pertinent previous research, research questions, terrain and field conditions in the project area. Before beginning fieldwork, the contractor conducts a site file search at the SHPO review and compliance office, and the Federal agency office. (BLM Permit Stipulations; BLM 8111 Cultural Resource Manual; 36CFR66; BLM/SHPO MOA; 36CFR800.4(a)(1)

2A. If the file search reveals that the project area has been completely or substantially surveyed previously, the contractor should notify the responsible Federal agency to determine if a resurvey of the area is necessary. If previous surveys are adequate to clear the project area, no resurvey may be warranted. The responsibility for determining the need for a survey rests with the Federal agency in consultation with the SHPO. (36CFR800.2 (m); 36CFR66; BLM 8111 Cultural Resource Manual)

2B. The contractor documents the results of the file search and agency notification in a letter report. The report should contain a complete bibliographic reference of the previous surveys and a summary of previous sites located. The contractor submits the letter report to the Federal agency, the SHPO and the client company. (36CFR800.2(m))

3. The contractor conducts the field survey of the project area. The overall field methodology, including survey intensity and areal limits, are determined by the Federal agency in consultation with the SHPO. (36CFR800.2(m); BLM 8111 Cultural Resource Manual; BLM/SHPO MOA; 36CFR66)

3A. If no sites are discovered during the survey, and if no previously recorded sites are located in the survey area, the contractor documents the negative results of the survey in 9.

3B. If sites are discovered during the survey, or if previously recorded sites are located in the survey area, the contractor follows steps 4 through 9.

4. The contractor records each site located, following procedures in BLM permit stipulations; BLM cultural resource guidelines; 36CFR66; SHPO guidlines.

5. The contractor evaluates each new site and each previously recorded site for National Register eligibility. Limited testing should be conducted as necessary. Criteria of Eligibility are listed in 36CFR60.6. (BLM 8111 Cultural Resource Manual; BLM Permit Stipulations; BLM/SHPO MOA; 36CFR63).

6-6A. If a site is not eligible for the National Register, no further work (i.e. testing, monitoring, excavation or avoidance) is warranted. If the site contains information significant enough to warrant further work, the site should be evaluated as eligible (see 7). The contractor documents his evaluation of non-eligibility and provides a recommendation of "no further work" in 9. (BLM/SHPO MOA; 36CFR60.6; 36CFR800; 36CFR63).

7-7A. If the contractor evaluates a site as eligible for the National Register, he must document the reasons for its eligibility. Discuss in detail how the site meets the Criteria of Eligibility (36CFR60.6). If the contractor considers a site eligible because of its research potential or information content (36CFR60.6[d]) the contractor must document and discuss the sites information content in terms of pertinent research questions which may be addressed. (36CFR60.6; BLM/SHPO MOA; 36CFR63)

8. The contractor evaluates the effect of the project on each eligible site. "Effect" is determined by applying the criteria in 36CFR800.3. Consider direct and indirect effects. (36CFR800; BLM/SHPO MOA)

8A1-8A2. If there will be no effect, or if the effect is not adverse, no further work at the site is warranted. No mitigative work is necessary if there are no adverse effects to mitigate. The contractor documents his evaluation of no effect or no adverse effect and makes a recommendation for no further work in 9. (36CFR800; BLM/SHPO MOA; BLM Permit Stipulations; BLM 8111 Cultural Resource Manual; 36CFR66)

8B1. If the impacts to the site will result in adverse effects, the contractor documents his evaluation of the adverse effects in 9.

8B 2. Recommendations to mitigate adverse effects should be directed at reducing or eliminating impacts to those qualities which make the site eligible for the National Register. Avoidance or preservation are the preferred options. Data recovery is appropriate if avoidance or preservation are not feasible or cost effective. Monitoring of construction is generally not an acceptable mitigation method. (36CFR63; 36CFR68; 36CFR800.6; BLM/SHPO MOA; BLM Permit Stipulations)

9. The contractor prepares a report documenting the results of steps 1 through 8A 2 and/or 8B 2 and submits copies of the report to the Federal agency, the SHPO and the client company. (BLM/SHPO MOA; BLM Permit Stipulations; 36CFR800; 36CFR63)

10. The Federal agency, in consultation with the SHPO, the Keeper of the National Register and the Advisory Council on Historic Preservation, uses the information provided by the contractor to carry the "106" review process to completion.

The Federal agency is the "cultural resource manager" in the "106" review process. The contractor, the SHPO, and the Advisory Council and the Keeper of the Register do not manage cultural resources. They provide professional information, expertise, review procedures and recommendations to the Federal agency to enable the agency to reach appropriate management decisions. (36CFR800)

REFERENCES CITED

36CFR60	Nominations by State and Federal Agencies to the National Register. FR Vol. 41 No. 28 February 10, 1976.
[same as]	HCRS Regulations Rescinded July 23, 1981
36CFR1202	Nominations by State and Federal Agencies to the National Register. Fr Vol. 44 No. November 7, 1979.
36CFR61	Criteria for Statewide Historic Surveys and Plans FR Vol. 42 No. 183 September 21, 1977.
[same as]	HCRS Regulations Rescinded July 23, 1981
36CFR1201	Criteria for Statewide Historic Surveys and Plans FR Vol. 45 No. 92 May 9, 1980.
36CFR63	Procedures for Requesting Determinations of Eligibility for Inclusions in the National Register. FR Vol. 41 No. 82 April 27, 1976.
[same as]	HCRS Regulations Rescinded July 23, 1981
36CFR1204	Procedures for Requesting Determinations of Eligibility for Inclusion in the National Register. FR Vol. 45 No. April 30, 1980.
36CFR66 (Proposed)	Recovery of Scientific, Prehistoric, Historic and Archeological Data: Methods, standards and Reporting Requirements FR Vol. 42 No. 19 January 28, 1977.
36CFR68	Secretary of the Interior's Standards for Historic Preservation Projects. FR Vol. 43 No. 178 September 13, 1978.
36CFR69 (Proposed)	Procedures for the Identification and Protection of Archeological, Architectural, Historic and Scientific Properties. FR Vol. 44 No. 140 August 2, 1979.
36CFR800	Protection of Historic and Cultural Properties FR Vol. 44 No. 21 January 30, 1979.
BLM/SHPO MOA	Memorandum of Agreement between BLM and SHPO October, 1981.

BLM 8111 Cultural Resources Manual--available at BLM State and District Offices.

BLM Permit Stipulations--issued as part of cultural resource contractors' antiquities permit.

FEDERAL LAWS

Mining Law of 1892; amended by P.L. 84-167 (69 Stat. 367, 43 USC 1185 et seq,
Desert Land Entry Act of 1877
National Forest Act of 1897 (30 Stat. 34)
River and Harbor Act of 1899 (P.L.55, 30 Stat. 1121)
Transfer Act of 1905 (33 Stat. 628, 16USC 472 et. seq.) [USFS]
Archeological Institute of American Act of 1906 (P.L. 59-182, 34 Stat. 203)
Antiquities Act of 1906 (P.L. 59-209, 34 Stat. 225, 16 USC 431-433)
Desert Land Entry Act of 1908
National Pork Service Organic Act of 1916 (P.L. 64-235, 39 Stat. 535)
Minerals Lands Leasing Act of 1920 (P.L. 66-146, 41 Stat. 437, 30 USC 181); amended by P.L. 93-153
Historic Sites Act of 1935 (P.L. 74-292, 49 Stat. 666, 16 USC 461-467)
Mineral Leasing Act for Acquired Lands of 1947 (P.L. 80-382, 61 Stat. 913, 50 USC et. s
National Historic Preservation Trust Act of 1949 (P.L. 81-408, 63 Stat. 927, 16 USC 461)
Housing Act of 1954 (P.L. 83-560, 68 Stat. 590, 12 USC 1703)
Fish and Wildlife Act of 1956 (P.L. 84-1024, 70 Stat. 1119)
Federal-Aid Highway Act of 1956 (P.L. 85-767, 72 Stat. 913, 23 USC 305)
Multiple-Use Sustained Yield Act of 1960 (P.L. 86-517, 74 Stat. 215, 16 USC 528-531)
Reservoir Salvage Act of 1960 (P.L. 86-523, 74 Stat. 220, 16 USC 469-469c)
_____ of 1962 (P.L. 87-714, 76 Stat. 653, 16 USC 460k)
_____ of 1963 (P.L. 88-29, 77 Stat. 49, 16 USC 460 l et seq)
Wilderness Act of 1964 (P.L. 88-577, 78 Stat. 890, 16 USC 1131-1136)
Federal Water Project Recreation Act of 1965 (P.L. 89-72, 79 Stat. 213); also called Fish and Wildlife Coordination Act of 1965
Water Resources Planning Act of 1965 (P.L. 89-80, 79 Stat. 244, 42 USC 1962): amended by P.L. 94-112 (89 Stat. 575)
Federal-Aid Highway Act of 1966 (P.L. 89-574, 80 Stat. 771, 23 USC 138)
National Historic Preservation Act of 1966 (P.L. 89-665, 80 Stat. 915, 16 USC 470)
Fish and Wildlife Conservation and Protection Act of 1966 (P.L. 89-669, 80 Stat. 926 16 USC 460k)
Department of Transportation Act of 1966 (P.L. 89-670, 80 Stat. 574, 23 USC 1 et seq.)
Housing and Urban Development Act of 1966 (P.L. 89-574, 80 Stat. 1279, 42 USC 1500)
Wild and Scenic Rivers Act of 1968 (P.L. 90-542, 82 Stat. 906, 16 USC 1271-1287)
National Trails System Act of 1968 (P.L. 90-543, 82 Stat. 919, 16 USC 1241-1249)
National Environmental Policy Act of 1969 (P.L. 91-190, 83 Stat. 852, 42 USC. 4321)
Geothermal Steam Act of 1970 (P.L. 91-581, 84 Stat. 1566)
Alaska Native Claims Settlement Act of 1972 (P.L. 92-203, 85 Stat. 188, 43 USC 1601)
Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500; 70 Stat. 498, 84 Stat. 91; 33 USC 1151)
Marine Protection, Research, and Sanctuaries Act of 1972 (P.L. 92-532, 86 Stat. 1052, 33 USC 1401 et seq.)
Archeological and Historic Preservation Act of 1974 (P.L. 93-201, 88 Stat. 174, 16 USC 469)
Forest and Rangeland Renewable Resources Planning Act of 1974 (P.L. 93-378, 88 Stat. 476, 16 USC 1600)
Housing and Community Development Act of 1974 (P.L. 93-383, 88 Stat. 633, 42 USC 5301)
Land and Water Conservation Fund Act of 1976 (P.L. 94-422)
Tax Reform Act of 1976 (P.L. 94-455, 90 Stat. 1525, 26 USC 1)
American Folklife Preservation Act of 1976 (P.L. 94-201, 86 Stat. 1129, 20 USC 2101)
Federal Land Policy and Management Act of 1976 (P.L. 94-579, 90 Stat. 2743, 43 USC 1

FEDERAL LAWS

National Forest Management Act of 1976 (P.L. 94-588, 90 Stat. 2743, 43 USC 1701)
National Park System Act of 1976 (P.L. 94-458, 90 Stat. 1939, 16 USC 470) Sec 11 (90 Stat. 1942) amends Sec. 101 (a) of P.L. 89-655 to withhold archeological site location information from public disclosure)
Surface Mining Control and Reclamation Act of 1977 (P.L. 95-87, 91 Stat. 445, 30 USC 1201 et seq.)
Soil and Water Resources Conservation Act of 1977 (P.L. 95-192, 91 Stat. 1407, 16 US 2001)
Endangered American Wilderness Act of 1977 (P.L. 95-237, 92 Stat. 40, 16 USC 1132)
American Indian Religious Freedom Joint Resolution of 1978 (P.L. 95-341, 92 Stat. 469, 42 USC 1996)
National Parks and Recreation Act of 1978 (P.L. 95-625, 92 Stat. 3467, 16 USC 1 et seq.)
Archeological Resources Protection Act of 1979 (P.L. 96-95, 93 Stat. 721, 16 USC470aa
Central Idaho Wilderness Act of 1980 (P.L. 96-312, 94 Stat. 948, 16 USC 1131 et seq.)
Housing and Community Development Act of 1980 (P.L. 93-399, 94 Stat. 1614) .(Sec. 110(c) on historic review)
Tax Act of 1980 (P.L. 95-51)
National Historic Preservotion Act Amendments of 1980 (P.L. 96-515)

FEDERAL EXECUTIVE ORDERS

E.O. 11200 (16 USC 4600-5 attachment 30 FR 2645) [recreation user fees]
E.O. 11593 (3 CFR1971 Comp. P. 154, 36 FR 8921) [historic properties inventory requ
E.O. 11980 (42 FR 26959) [off-road vehicle regulations]
E.O. 12114 [environmental effections of actions abroad]

FEDERAL REGULATIONS

7 CFR 650: Compliance with the National Environmental Protection Act (44 FR 50576) [USDA, SCS]
7 CFR 656: Procedures for the protection of archeological and historical properties encountered in SCS assistance programs (46 FR 9610, proposed) [USDA, SCS]
7 CFR 799: Preparation of environmental statements: guidelines (39 FR 43996) [USDA, ASCS]
7 CFR 3100: Enhancement, protection and management of the cultural environment: final rulemaking (44 FR 66179) [USDA, OEQ]
10 CFR 2, 30, 40, 50, 51, 70, 110: Environmental protection regulations for domestic licensing and related regulatory functions and related conforming amendments (45 FR 13739, proposed) [NRC]
13 CFR 309: Environmentol requirements for financial assistance (45 FR 74902) [Dept. of Comm, EDA]
18 CFR 713: Procedures for evaluation of national economic development (NED) benefits and costs in water resource planning (Level C) (44 FR72892) [WRC]
18 CFR 726: Compliance with the National Historic Preservation Act (NHPA); protectio and management of the historic and cultural environment (45 FR 76701, proposed) [WRC]
23 CFR 771: Environmental impact and related procedures (45 FR 71968) [DOT, FHWA; same as 49 CFR 622 for DOT, UMTA]
24 CFR 570.604: HUD community development block grants (40 FR 24709) [HUD]
24 CFR 600.66: HUD 701 comprehensive planning assistance (40 FR 36861) [HUD]
25 CFR 132: Preservation of antiquities (38 FR 18547) [USDI, BIA]
25 CFR 281: Heritage preservation (45 FR 60923, proposed) [USDI, BIA]

FEDERAL REGULATIONS

30 CFR 700-890: Reclamation and enforcement (44 FR 15311) [USDI, OSM]
30 CFR 910: Surface coal mining and reclamation operation under Federal program for Georgia (45 FR 61120, proposed) [USDI, OSM]
33 CFR 305: Identification and administration of cultural resources (43 FR 13990) [Army, CE]
33 CFR325: Processing of Department of the Army permits; procedures for the protection of cultural resources (45 FR 22112) [Army, CE]
36 CFR 219: National Forest System land and resource management planning (44 FR 6068) [ACHP]
36 CFR 801: Historic preservation requirements of the Urban Development Action Grant program (46 FR 5578, proposed) [ACHP]
36 CFR 61: Criteria for comprehensive statewide historic surveys and plans (42 FR 47658) [USDI, NPS]
36 CFR 60: National Register of Historic Places (41 FR5904) [USDI, NPS]
36 CFR 63: Determinations of eligibility for inclusion in the National Register of Historic Places (42 FR 47661, interim) [USDI, NPS]
36 CFR 1205: National Historic Landmarks program; interim rules (44 FR 74726) [USDI, HCRS]
36 CFR 1207: Standards for historic preservation projects (43 FR 57259) [USDI, HCRS]
36 CFR 66: Recovery of scientific, prehistoric, historic and archeological data: methods, standards and reporting requirements (42 FR 5374, proposed) [USDI, NPS]
36 CFR 1212: National Natural Landmarks program (45 FR 81184) [USDI, HCRS]
36 CFR 1213: Procedures for the identification and protection of archeological, architectural, historic and scientific properties (44 FR 45417, proposed) [USDI, HCI
36 CFR 1215: Archeological Resources Protection Act of 1979; proposed uniform rule-making (46 FR 5566, proposed) [USDI, HCRS]
40 CFR 35: Cooperative agreements for protecting and restoring publicly owned freshwater lakes (45 FR 7788) [EPA]
40 CFR 1500: Preparation of environmental impact statements: guidelines (43 FR 55978) [CEQ]
43 CFR 3: Uniform rules and regulations prescribed by the Secretaries of the Interior, Agriculture and War to carry out the provisions of the "Act for the Preservation of American Antiquities," approved June 8, 1906 (59th Congress, 2d Session, Senate Document No. 396, Pt. 1, pp. 320-322 [1907]) [USDI, USDA, War]
43 CFR 422: Procedures for the identification and administration of cultural resources (43 FR 46538) [USDI, BR]
43 CFR 1600: Planning, programming and budgeting (43 FR 58764, proposed) [USDI, BLM]
43 CFR 1780: Cooperative relations: advisory committees (45 FR 8176) [USDI, BLM]
43 CFR 8340: Off-road vehicles, use of public land (44 FR 34834, proposed) [USDI, BLM
45 CFR 640: National Environmental Policy Act regulations.(45 FR 39) [NSF]
49 CFR 622: Environmental impact and related procedures (45 FR 71968) [DOT, UMTA; same as 23 CFR 771, DOT, FHWA]
50 CFR 4: Procedures for the identification and protection of archeological, historic and scientific properties (44 FR 61231) [USDI, FWS]

MISCELLANEOUS FEDERAL STATEMENTS

Advisory Council on Historic Preservation Executive Director's Procedures for Review of Proposals for Treatment of Archeological Properties; Supplementary Guidance (45 FR 78808)

MISCELLANEOUS FEDERAL STATEMENTS

BLM Instruction Memorandum No 81-29 (esp. 30 Sept. 1981): Cultural inventories on non-Federal lands related to the grant of a Federal right-of-way

BLM Statement of Policy: Coordination of Federal lands review under the Surface Mining Control and Reclamation Act, Land Use Policy and Management Act, and the Federal Coal Management Review under the President's Environmental Message of May 1977 (43 FR 57662)

President Carter;s Memorandum on Environmental Quality and Water Resources Management (12 July 1978; to Water Resources Council, Attorney General, TVA, ACHP)

Procedural Manuals: U.S. Forest Service, Fish and Wildlife Service, National Park Service, Corps of Engineers, Bureau of Land Management, Soil Conservation Service, Bureau of Reclamation, Federal Highway Administration, etc.

USDI, HCRS, Archeological and Historic Preservation Act of 1974 Statement of Program Approach (44 FR 18117)

U.S. World Heritage List nomination process; interpretive guidelines (46 FR 3073) [USDI, HCRS]

Wetland-riparian area protection and management; policy and protection procedures (45 FR76701, proposed) [WRC]

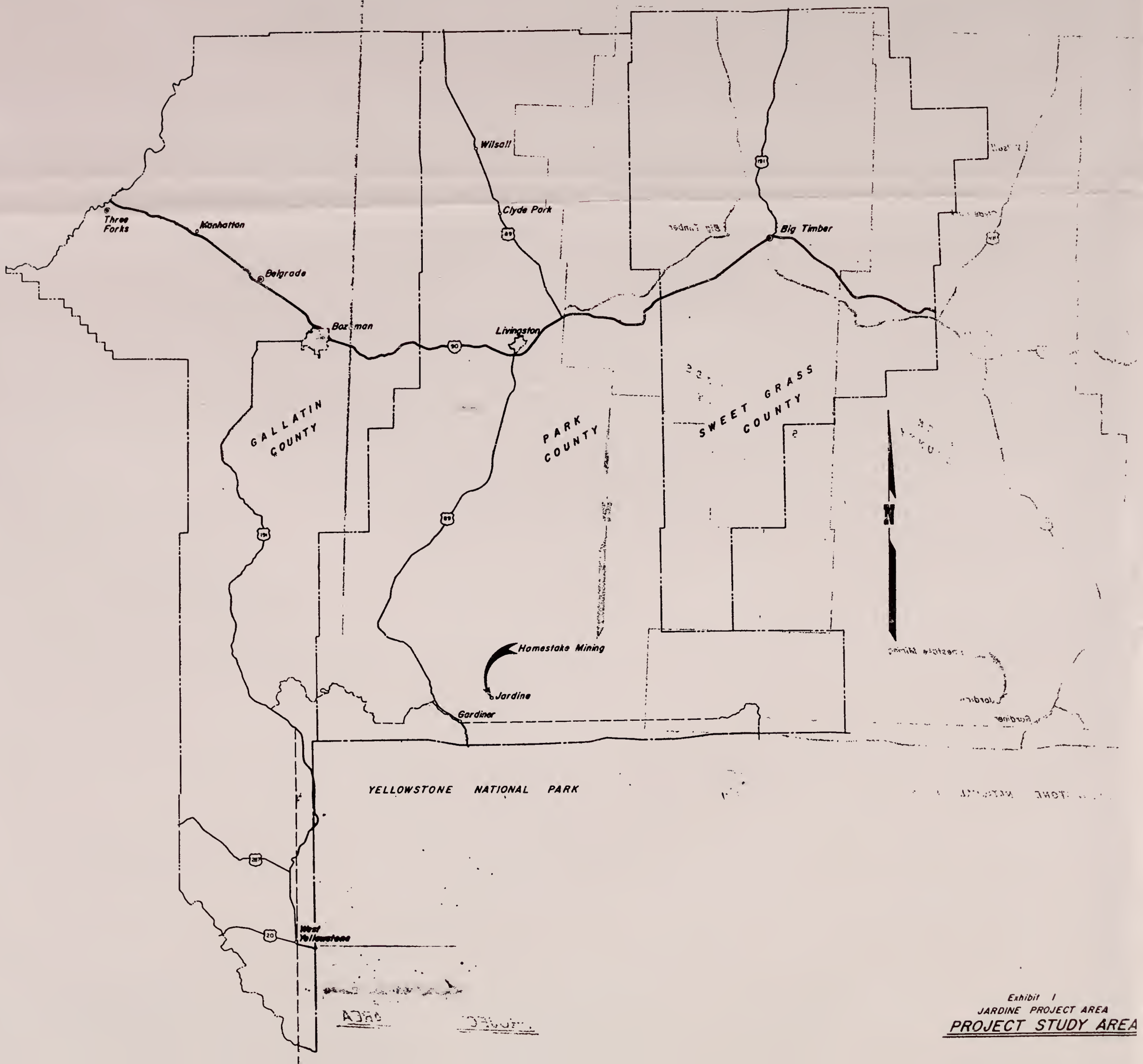


Exhibit 1
JARDINE PROJECT AREA
PROJECT STUDY AREA